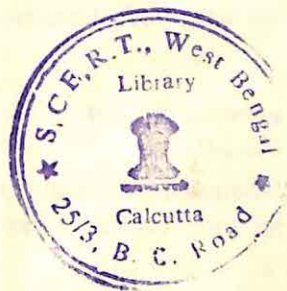


**CURRICULUM AND EVALUATION**

# CURRICULUM AND EVALUATION

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NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्  
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## FOREWORD

Curriculum and its evaluation is usually offered as a subject of study in most of the universities for B.Ed. degree course. The need for developing a suitable textbook which would give the latest methods and techniques in the development of curriculum and in evaluating its implementation as well as of the achievement of pupils has been felt for long. To meet this need, the Department of Teacher Education, NCERT, developed the present volume with the help of a team of authors. The book aims to develop among prospective teachers an understanding of curricular objectives, the organisation of curriculum, instructional strategies and evaluation. I hope teacher educators will find the book useful in teaching at the B.Ed. level.

I am thankful to Prof. R.C. Das, Head, Department of Teacher Education and the team of authors namely, Prof. K.K. Pillai, Prof. H.C. Sinha, Prof. B.K. Passi and Dr. B.K. Mattoo for developing this textbook. We would welcome suggestions for its improvement from teacher educators after they have tried this book.

P.L. MALHOTRA  
*Director*

National Council of Educational  
Research and Training

New Delhi  
*March, 1984*

## PREFACE

In order to bring about suitable reform in the teaching at the B.Ed. level in accordance with the suggestions of the National Council for Teacher Education as given in the Teacher Education Curriculum, the Department of Teacher Education, NCERT, undertook to develop a textbook on Curriculum and Evaluation which is one of the important areas of study at the B.Ed. level. The book was developed as a team project by a team of authors consisting of Prof. K.K. Pillai, Prof. H.C. Sinha, Prof. B.K. Passi and Dr. B.K. Mattoo. The book has discussed the process of curriculum developed from the objectives of education and instructional strategies. It has also discussed the principles of evaluation in relation to the curriculum and the objectives. It is hoped that this book will meet the felt need in secondary teacher education.

R.C. DAS

*Head*

Department of Teacher Education

National Council of Educational  
Research and Training

New Delhi

March, 1984

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**SECTION 1.0**  
**CURRICULUM AND OBJECTIVES**



STATION 10  
CORRIGAL AND ORIEL

## MODULE 1.1

### CONCEPT OF CURRICULUM

---

#### 1.1.0 : Specific Objectives of the Module

The students, after reading the Module, should be able to :

1. define 'Curriculum'.
2. distinguish curriculum from
  - (a) subjects of study.
  - (b) syllabi.
  - (c) pupil-activities.
  - (d) instructional strategies.
3. establish the relationship between curriculum and
  - (a) educational objectives.
  - (b) evaluation.
4. explain how each of the following is used as a source for curriculum planning.
  - (a) Philosophical objectives of education.
  - (b) Sociological objectives of education.
  - (c) Psychological objectives of education.
5. describe how curriculum-changes occur in a system of education.
6. list the essential elements of a good curriculum.

### 1.1.1 : Concept of Curriculum

The term *curriculum* is derived from the Latin word *currere* which means "run"; and it signifies "a run-way" or "a course which one runs to reach a goal". In education it is generally identified with a course of studies or list of subjects prescribed for a course. In fact, a list of subjects forms only a part of the curriculum; and it does not constitute the whole of it. A curriculum means the total situation (or all situations) selected and organized by the institution, and made available to the teacher to operate, and to translate the ultimate aim of education into reality. Carter V. Good defines curriculum as "a general over-all plan of the content or specific materials of instruction that the school should offer to the student by way of qualifying him for graduation or certification for entrance into a professional or a vocational field".<sup>1</sup> The Secondary Education Commission points out that a curriculum "does not mean only the academic subjects traditionally taught in the school, but it includes the totality of experiences that a pupil receives through the manifold activities that go on in the school, in the classroom, library, laboratory, workshop, play-grounds and in the numerous informal contacts between teachers and pupils. In this sense, the whole life of the school becomes the curriculum which can touch the life of the students at all points and help in the evolution of a balanced personality".<sup>2</sup> In the words of Crow and Crow curriculum "includes all the learner's experience in or outside school that are included in a programme which has been devised to help him develop mentally, physically, emotionally, spiritually and morally".

### 1.1.2 : Curriculum and its Elements

The curriculum includes the totality of experience that the student receives in the institution, and it encompasses mainly the subjects of study, and the activities provided by the teacher. In India the State Department of Education or the University prescribes subjects, their detailed syllabi and related textbooks for every course of study. By and large such subjects belong to four categories—languages, sciences, humanities and physical education; and each of these includes a number

1. Carter V. Good (Ed.). "Dictionary of Education" McGraw Hill Book Company, Inc. New York, 1959, p. 142.

2. Report of the Secondary Education Commission (1952-53), Ministry of Education, Govt. of India (p. 65)

W. Crow and A.W. Crow. "Introduction to Education", Delhi; Euraga Publishing House, 1962, p. 250.



of subjects. For instance, languages include Indian and Foreign languages ; and Indian languages include the mother tongue, the regional languages, the national language, and modern languages ; and so on. Sciences include physical and natural sciences ; and physical sciences include physics, chemistry, bio-physics, bio-chemistry, geology etc ; and natural sciences include biology, zoology, marine sciences etc. Every institution prescribes a variety of activities which are normally known as curricular, co-curricular and extra-curricular activities. Activities such as self study, creative writing, observation, experimentation, work experience, projects etc. are curricular activities. Academic discussions, debates, participation in symposium, panel discussion and seminar etc., are co-curricular activities, while field trip, sports meet, celebration of birthdays of national leaders and of national festivals, etc., are extra-curricular activities. Although such activities are known as co-curricular and extra-curricular, they are indeed an integral part of curriculum. In fact the teacher employs these as methods to teach the various subjects of curriculum.

### 1.1.3 : Correlates of Curriculum

The curriculum has a triangular relationship with educational objectives and evaluation. Every curriculum is intended to achieve certain educational objectives ; and educational objectives are of three kinds—philosophical, sociological, and psychological. Philosophical objectives of education pertain to faiths and values in respect of spiritual and social aspects of life. Spiritual values, such as of ultimate reality and dignity of the individual, are permanent and fundamental ; and the social values, such as of child labour and dowry system, are transient, and vary from region to region, and time to time. Sociological objectives deal with the social order in relation to social change as well as the needs of society and aspirations of people. Obviously social order is not universal in nature, and it varies from region to region, and time to time. Psychological objectives are related to psychological characteristics and the needs of individual students. Although the human nature is same all over the world, each individual is a psychological entity with his own physical, mental and emotional characteristics ; and under certain conditions, these characteristics of the individuals differ because of their interaction with the physical, natural, social and cultural environment ; and *ipso facto* no two individuals are alike in their mental capacities and personality traits. Thus only a few educational objectives are permanent or universal and others are transient, varying from region to region and time to time. Therefore, a curriculum cannot be static. A consideration

of the relationship between curriculum and evaluation would confirm this. Technically evaluation is an integral part of curriculum ; and it attempts to assess the effectiveness of a curriculum in terms of the achievement of educational objectives. If evaluation shows poor performance of the students, other things being normal, the curriculum is defective ; and it indicates the need for improvement or modification of the curriculum.

Thus, objectives, and evaluation determine the curriculum. As and when objectives change as in the context of evolution of new values, emergence of a new social order, and better understanding of psychological characteristics and needs of individuals, as well as when evaluation indicates a positive need, the curriculum changes. Therefore, there can be no curriculum of universal application. But all this does not mean that the curriculum should be a handmaid of educational objectives and evaluation ; on the other hand, it emphasises the possibilities for the curriculum to take the lead in the creation of new values of life, and new social order. Thus the curriculum is not only a servant, but also a master in a system of education.

#### 1.1.4 Test Yourself

1. What are the various elements of a good curriculum ?
2. Explain a few activities that can come under the purview of a good curriculum.
3. State the educational objectives under broad categories.
4. To what extent is the textbook a suitable substitute for curriculum ?
5. How do teaching methods help to satisfy the needs of a good curriculum ?
6. What factors contribute to changes in curriculum ?
7. Distinguish between the following pairs of activities :
  - (a) Curricular and co-curricular activities
  - (b) Curricular and extra-curricular activities
  - (c) Co-curricular and extra-curricular activities.
8. Critically examine the syllabus for a subject using the criteria of the various elements of a good curriculum.
9. To what extent is the conceptual difference between the following pairs of activities relevant to the concept of a good curriculum ?
  - (a) Curricular and co-curricular activities
  - (b) Curricular and extra-curricular activities
  - (c) Co-curricular and extra-curricular activities.



10. 'The curriculum is not only a servant but also a master in a system of education'. Examine this statement with reference to the secondary school syllabus of your State.

### 1.1.5 Correct Answers

- Qn. 1. Ref. 1.1.2  
Qn. 2. Ref. 1.1.2  
Qn. 3. Ref. 1.1.3  
Qn. 4. Ref. 1.1.1  
Qn. 5. Ref. 1.1.3  
Qn. 6. Ref. 1.1.3  
Qn. 7. Ref. 1.1.2  
Qn. 8. Ref. 1.1.2  
Qn. 9. Ref. 1.1.2  
Qn. 10. Ref. 1.1.3

### 1.1.6 : Suggestions for further Reading

1. Chandra, Arvind "Curriculum Development and Evaluation in Education", Delhi, Sterling publishers, 1977.
2. Fleming, Robert(s) "Curriculum for today's boys and girls", New York : Holt Rinehart, 1964.
3. Heath, Robert (Ed.) "New Curricula", New York : Harper and Row, 1964.
4. Kelly, A.V. "The Curriculum—Theory and Practice" London, Harper & Row, 1977.
5. Levy Arie "Planning the School Curriculum", Paris : UNESCO, 1977.
5. Wheeler, D.K. "Curriculum Process", London : University of London Press, 1967.





## MODULE 1.2

### BASES OF CURRICULUM

---

#### 1.2.0 Specific Objectives of the Module

The students, after reading the Module, should be able to :

1. recognize the basic tenets of the major philosophies of education, and their implications for curriculum.
2. distinguish between the implications of the following pairs of educational philosophies for curriculum development
  - (a) Naturalism and idealism.
  - (b) Naturalism and pragmatism.
  - (c) Idealism and pragmatism.
3. state the implications of the philosophy of 'scientific humanism' for curriculum development.
4. explain how the major philosophies of education help to formulate a 'balanced curriculum'.
5. state the major recommendations of Kothari Commission on curriculum development.
6. describe the nature of a curriculum structure on the following bases :
  - (a) Philosophical basis.

- (b) Sociological basis.
- (c) Psychological basis.
- 7. explain the implications of the following for curriculum development.
  - (a) Psychology of Child Development.
  - (b) Psychology of Individual Differences.
- 8. bring out the deficiencies of a "straight jacket" curriculum on psychological considerations.
- 9. describe the importance of cultural heritage in a curriculum.
- 10. explain the need for a curriculum to be community based.
- 11. explain the major social problems of India and their implications for curriculum development.
- 12. examine the role of curriculum makers in relation to that of economists and sociologists in meeting social problems.

### 1.2.1 Bases of Curriculum

Every curriculum attempts to achieve certain educational objectives ; and educational objectives pertain to the philosophy of the nation, social needs and aspirations of the people, and psychological needs of the individuals. Therefore, curriculum is based upon certain principles regarding these areas in relation to education. Thus, curriculum has three bases—philosophical, sociological, and psychological.

### 1.2.2 Philosophical basis

Philosophy deals with the nature of reality, the nature of man, the goal of life, and the fundamental beliefs and values of life pertinent to these ; and education helps to understand or to achieve these. Thus, philosophy and education are intimately connected. In the words of James S. Ross "philosophy and education are like the two sides of a coin .....the former is the contemplative side, while the latter is the active side".<sup>1</sup> Thus, there are as many philosophies of education as there are philosophies of life. Of these, three are important, because of their applications to the educational system in most of the countries of the world ; and they are naturalism, idealism and pragmatism.

Naturalism postulates that education should focus on the nature of the child which is dynamic ; and it should find "its purpose, its process, and its means within the child experience".<sup>2</sup> Accordingly, the curriculum

1. James S. Ross "Ground Work of Educational Theory", London : George G. Harrap & Co. Ltd., 1960, p. 11.  
 2. Ibid. p. 86



should include those subjects which are in conformity with the interests and the needs of the students, and also those pertaining to the natural environment in which the students live, act and react. Thus, according to naturalists curriculum should give great importance to the sciences which deal with nature namely physics, chemistry, botany and zoology.

Idealism asserts that man is a spiritual being ; and according to Ross "man's spiritual nature is not something just added to man, but the very essence of his being".<sup>3</sup> Therefore education should help students to realize his spiritual "self". Again quoting Ross, the aim of education should be "self realization, the making actual or real, the highest potentiality of the self".<sup>4</sup> Obviously self-realization is not possible unless the student has a deep insight into his cultural heritage as well as the maturity to think, reason and judge. Accordingly, curriculum should provide for three types of activities—intellectual, aesthetic and moral, and also for subjects regarding these—literature, science, mathematics, history and geography regarding intellectual activities ; art and poetry regarding aesthetic activities ; and religion, ethics and metaphysics regarding moral activities.

Pragmatism does not believe in the existence of absolute values—truth, goodness, and beauty. It asserts that nothing is absolute, and everything is relative—truth is what works out in practice ; goodness is what proves to be useful ; and beauty is what appears to be aesthetic. Therefore, education should aim at training the student to develop values for himself. Pragmatists emphasize that knowledge should not be imparted ; but on the other hand students should be enabled to create it in their activities. In the words of Brubacher, "knowledge is something which is wrought out in action..... knowledge does not antedate learning but is forged as the pupil and teacher adapt means to ends as their project develops".<sup>5</sup> Accordingly, curriculum should include projects and activities rather than subjects in water tight compartments.

The curriculum as contemplated in naturalism, idealism and pragmatism gives emphasis to either natural sciences, or to social sciences or to practical activities respectively ; and therefore, it is lopsided or incomplete. A good curriculum is one which is balanced in respect of these, or comprehensive as determined by the philosophy of scientific humanism.

The philosophy of scientific humanism deals with both the scientific and humanistic aspects of life. Needless to say that sciences deal with

3. Ibid. p. 124

4. Ibid., p. 52

5. John S. Brubacher, "Modern Philosophies of Education", New York: (McGraw Hill Book Company), 1980, p. 71.

matter, and take men to the mysteries of the material world. They help to solve problems of human life pertaining to health, transport, communication etc. Thus, sciences are essential for man's survival and progress. But, sciences cannot solve all problems of human life. It is a fact that human life is partly materialistic and partly, if not fundamentally, spiritualistic; and therefore, sciences alone cannot take care of both aspects. Hence humanities, social sciences, aesthetics and religion have equal importance. These subjects unravel the secret of nature; deal with the ethical, spiritual and social values; explain the dignity of the individual; and expound the principles of the fatherhood of God and brotherhood of man. Therefore, the curriculum should be balanced in respect of sciences as well as humanities, and related subjects. Further, it should provide for the teaching of sciences from the humanistic point of view and for spiritual insight. Regarding these Education Commission<sup>6</sup> makes certain pertinent observations.

1. Science education should become an integral part of school education and ultimately become a part of all courses at the university stage also.
2. At the school level, an effective programme of social studies is essential for the development of good citizenship and emotional integration.
  - (a) The syllabus should stress the idea of national unity and the unity of man
  - (b) The scientific spirit and method of the science should permeate the teaching of social studies at all stages.
3. The social sciences should be given a significant position in Indian universities and research institutions.
4. A syllabus giving well chosen information about each of the major religions should be included as a part of the course in citizenship or as a part of general education to be introduced in schools and colleges upto the first degree. It should highlight the fundamental similarities in the great religions of the world and the emphasis they place on the cultivation of certain broadly comparable moral and spiritual values.

### 1.2.3 Sociological basis

Education has a social obligation. Therefore, the curriculum should have relevance not only to the existing society but also to the emerging society; and not only to the community in which the students live but also to the society at large. The Secondary Education Commission

6. Report of the Education Commission, (1965-66), New Delhi: Ministry of Education, Govt. of India, pp. 6-7.



postulates that the "curriculum must be vitally and organically related to community life".<sup>7</sup>

Every community has a culture of its own—its values, beliefs, ideals, traditions and so on; and in fact, these determine its individuality and integrity. The individuals who constitute a community should know its culture lest they create problems of social adjustment. The knowledge of one's cultural environment is necessary for one's development. All these imply that the curriculum should reflect the culture of the community to which the students belong. In the words of Ross, "the purpose of the school is to reflect the civilization itself; the main purpose, therefore, of the course of studies is to epitomize and organize in representative fashion at least, the capitalized experience of the race of which the child is a member".<sup>8</sup> All these do not mean that the function of a curriculum is over when it makes an attempt to perpetuate the values, ideals, traditions, etc. of the community. In fact curriculum has another important function also to fulfil. It should assist the community to evolve a new culture which would be in tune with the needs of the contemporary society. This function of the curriculum may be considered with reference to Indian education.

The contemporary Indian society is passing through the process of cultural renaissance. In this context education should "endeavour to relate it to the life, needs and aspirations of the people and thereby make it a powerful instrument of social, economic and cultural transformation necessary for the realization of our natural goals—*democracy, socialism, secularism, national integration, productivity, and modernisation*".<sup>9</sup> The curriculum should (a) relate itself to productivity, (b) strengthen social and national integration, (c) hasten the process of modernization, and (d) strive to build character by cultivating social, moral, and spiritual values. The curriculum should provide for the

- (a) teaching of science as a basic component ;
- (b) work experience as an integral part of general education ;
- (c) vocationalisation of education, and
- (d) improvement of scientific and technological education at the university stage with special emphasis on agriculture and allied sciences ;

The contemporary Indian society faces certain problems consequent upon these phenomena—the growth of population, the advancement of sciences and technology, the explosion of knowledge, and finally urbaniza-

7. Ibid., p. 66

8. James S. Ross, op. cit., p. 83

9. Report of Secondary Education Commission, op. cit., p. 68

tion ; and these have implications for curriculum development as stated below.

As early as 1951 the population of India was 361 million and in 1971 it was 550 million. Thus there has been an annual growth of about 2.5 per cent. The growth of population alongwith the progressive policies of the government has caused excessive enrolment in institutions at all levels of education. As early as 1965, according to the estimate of the Education Commission the student population in India was about 70 millions, and in the next 20 years, that is by 1985, it is estimated that it would increase to about 170 millions. The enormous size of the student population has important educational implications. For instance, an ordinary class becomes heterogeneous in respect of sex, age, experience, social and economical status and so on. Further, educated persons hardly secure suitable jobs within the narrow limits of their States, and of the Nation ; and they have to go far beyond. All these in turn make demands on the curriculum.

1. The curriculum should attempt not only to impart knowledge and understanding, but also develop attitudes necessary for students to live cooperatively with the people of different cultural background, in India and abroad.
2. As already emphasised curriculum should provide for the varying needs and interests of students—academic, vocational and professional
3. The curriculum should include work experience as well as variety of vocational and job oriented courses which would enable students to secure jobs in farms and factories.

The second half of the 20th century is characterised by advancement in sciences and technology, such as, nuclear fission and fusion, high-speed electronic computers, data sorting and storing machines, supersonic aircraft, space satellites, and cybernation. These developments in science and technology have made impact on every aspect of social life and on the working of social institutions, say agriculture, commerce, business, industries, so on. It has implications for curriculum development. The curriculum should provide for the teaching of subjects and also for activities which would enable students to acquire the knowledge needed to use present day technology and to continue the acceleration of the rate of change in scientific development, to develop attitudes to control and use change for human betterment, and to develop the skills and technical competencies that will enable them to prepare for a place in the world of the future and utilize fully their talents and capabilities. It should also include subjects which would promote in students a concern for human



welfare and a personal morality that uses technical achievements for the benefit of mankind. It is a fact that the increased use of scientific techniques in general and the computer and the cybernatics in particular has changed the occupational patterns ; and these have not only changed the nature of jobs, but also created a cluster of new jobs in manufacture, service, and operation of machines. Therefore, the curriculum should provide for teaching of subjects relevant to the variety of occupational patterns in the community, which would prepare students to face the unexpected challenges of the occupational world of tomorrow.

Researches in various disciplines contribute to the enormous growth of the existing knowledge. The rate of 'knowledge generation' is tremendous. These phenomena create a dilemma for curriculum planners. A number of questions crop up. What knowledge is most worth ? What knowledge out of the vast reservoir should be selected for students to study ? etc. As already stated, curriculum should include certain subjects, which can help an ordinary student to acquire new knowledge in the ever expanding world of knowledge. It should also include subjects which would cater to the needs of specialists.

India is a land of villages, and more than 70% of it is constituted by villages. Despite this, villages do not have adequate modern facilities of life in respect of say, water supply, sanitation, electricity, transport, education and so on. As the number of the industries has grown in urban areas tremendously during all these years and rapid social mobility has been taking place from villages to towns and cities, the villages are getting progressively deserted and cottage industries, including agriculture are being neglected. The rapid progress of industrialisation and urbanisation has created a variety of problems in cities—growth of slums, poor sanitation, inadequate water supply, insufficient energy, and so on. In order to find effective and permanent solution, these problems should be tackled not only by economists and sociologists but also by educationists. The curriculum should provide for the teaching of subjects which would facilitate community development and ensure social progress. The subjects should enable students to attain an increased understanding of and mastery over the social processes. They should also help students to find self-employment, in case jobs are not available in farms and factories.

#### 1.2.4 Psychological Basis

The Psychology of Child Development indicates that each individual has certain capabilities, abilities, interests and attitudes, and other potentialities ; and further, every one has certain physical, mental and emotional needs, and sometimes some psychological problems, such as of adjustment

too. The Psychology of Individual Differences indicates that no two individuals are alike in their psychological characteristics. All these imply that any curriculum which claims a meaningful basis should be geared to the mental abilities and personality qualities of students; and it should cater to their intellectual, emotional and aesthetic needs. Further, the curriculum should be adaptable to the varying abilities and needs of students. Thus, a uniform curriculum has no relevance to the needs of students and to individual differences among them. In this context Ryburn makes a pertinent remark: "One of our besetting sin is a desire for uniformity and conformity. We are content so to bind our own souls and the souls of our children with the chains of conformity and orthodoxy that there is no motive power left that will lead to achievement. Our zeal for uniformity kills our zeal for truth".<sup>10</sup> The curriculum should be more than a procrustean bed in which every student should be fitted. The Secondary Education Commission pertinently states that "there should be enough variety and elasticity in the curriculum to allow for individual differences and adaptation to individual needs and interests".<sup>11</sup> The curriculum should include certain subjects or subject areas, which can be learnt by a student of average physical and mental potentialities; subjects which may be of special interest to some students and others and would go a long way in meeting their special needs; and subjects which are geared to the intellectual needs of the brilliant students as well as to that of the backward ones. Thus the content matter of curriculum should make a liberal provision for a variety of subjects—theoretical, practical, vocational, core, elective and special—and advanced and remedial courses.

### 1.2.5 Test yourself

1. What does curriculum draw from the following for its development?
  - (a) Philosophy of education
  - (b) Sociology of education
  - (c) Psychology of education
2. Explain the following:
  - (a) Value-oriented curriculum
  - (b) Community-centered curriculum
  - (c) Need-based curriculum
3. What is the relative importance of natural sciences and social sciences in a curriculum?

13. W.M. Ryburn, "Introduction to Educational Psychology", Oxford University Press, 1959, p. 122.

11. Report of the Secondary Education Commission, opt. cif., p. 65.



4. Explain the need for the following :
  - (a) Advanced courses
  - (b) Remedial courses
5. Distinguish core courses from special courses.
6. (a) How does a curriculum with the following subjects satisfy the various bases of curriculum ?
  - (i) Core subjects and special subjects.
  - (ii) Advanced courses and special courses.
7. (a) How will you justify the inclusion of the following in curriculum ?
  - (i) Cultural heritage
  - (ii) Religion
  - (iii) Sciences
  - (iv) Social Sciences
  - (v) Technology
  - (vi) Work experience
  - (vii) Vocational courses
  - (viii) Job-oriented courses
8. Bring out the need for the inclusion of advanced courses from the following view points.
  - (a) Philosophy of Education
  - (b) Sociology of Education
  - (c) Psychology of Education.
9. Critically examine the following from the requirements of the philosophy of scientific humanism.
  - (a) Curriculum at the school level
  - (b) Curriculum at the university level.
10. With your knowledge of the bases of curriculum, suggest a curriculum for secondary schools.

**1.2.6 Correct Answers**

Qn. 1. (a) Ref. 1.2.2	Qn. 3. Ref. 1.2.2	Qn. 8. (a) Ref. 1.2.2
(b) Ref. 1.2.3	Qn. 4. (a) Ref. 1.2.3	(b) Ref. 1.2.3
(c) Ref. 1.2.4	(b) Ref. 1.2.4	(c) Ref. 1.2.4
Qn. 2. (a) Ref. 1.2.2	Qn. 5. Ref. 1.2.3	Qn. 9. Ref. 1.2.2
(b) Ref. 1.2.3	Qn. 6. Ref. 1.2.4	Qn. 10. Ref. 1.2.2
(c) Ref. 1.2.4	Qn. 7. Ref. 1.2.3	1.2.3., 1.2.4

**1.2.7 Suggestions for further reading**

1. Bent, R. and Un Rah Adolph "Secondary School Curriculum", Lexington, U.S.A., 1969.
2. Golby Michael "Curriculum Design", London, The Open University Press, 1975.
3. Kelly, A.V. "The Curriculum—Theory and Practice", London : Harper and Row, 1977.
4. Kerr, John F. (Ed.) "Changing the Curriculum" UNI Books, University of London, 1974.
5. Lewy Arie "Planning the School Curriculum", Paris : UNESCO, 1977.
6. Tayler, P.H. and Tye, K.A. "Curriculum, School and Society", London : NFER Publishing Company, 1975.
7. Wheeler, D.K. "Curriculum process", London : University of London Press, 1967.

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## **MODULE 1.3**

### **CURRICULUM—NATIONAL, STATE AND LOCAL LEVELS**

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#### **1.3.0 : Specific Objectives of the Module**

The students, after reading the Module, should be able to :

1. recognize the traditional practices in curriculum development in India.
2. recognize the historical background of practices in curriculum development in India.
3. understand the legal background of central curriculum planning in India.
4. understand the limitations of central planning in curriculum development.
5. identify the need for the decentralization of curriculum planning.
6. find reasons for curriculum development at the State and local levels.
7. distinguish :
  - (a) the curriculum at the national level from that the State level; and
  - (b) the curriculum at the State level from that at local level.
8. understand the need for co-ordination of efforts of curriculum development at the national, State, and local levels.



### 1.3.1 : Tradition in Curriculum Development

Under our Indian system of education, the Government at the Centre through its agencies like the Central Board of Education, NCERT, and UGC as well as a number of committees and commissions that it appoints from time to time, lays down educational objectives and curricula for schools and universities in the country; and the Government in the States through its agencies like the Directorate and State Institute of Education and State level committees, prepares the syllabi for school education at various levels, and through universities prepare the syllabi for courses of Higher Education. The curriculum planning at the State level for both schools and universities is invariably influenced by the educational thoughts, policies and programmes of the Centre.

The centralized model of curriculum planning has been in vogue in India for the last several decades. Indeed, it is a legacy of the British system of education. The British who ruled over us for over two centuries imposed a national curriculum on schools and colleges with the notion that Indians are the inhabitants of villages, illiterate, and less cultured; and therefore; they cannot take decisions on what they have to learn. This policy of "de-indianising" the natives served their administrative purposes. Even after the British have left India, the educational system continues to use the centralized model of curriculum making; and it is found that even the vital agencies of education like community and family, the practitioners of education like administrators and teachers, and consumers of education, that is, the students feel at home with a curriculum pushed down from above, and do not desire to get involved in the process of curriculum making, or to develop an independent curriculum to meet their own needs.

### 1.3.2 : National Model

The centralized model of curriculum making has legal justification. Several Articles of Indian Constitution including the Article (66) regarding "coordination and determination of standards in institutions for higher education or research and scientific and technical institutions" give the legal responsibility to the Central Govt. to maintain the national character of education, to establish national scholastic standards, and to maintain the standard of Indian education at par with international standards. It may be added that, if each State develops its own curriculum, it would lead to imbalances in educational development, and to a variety of problems not only of education but also of national development.



The centralized model of curriculum impairs education in several respects. It perpetuates a standardized curriculum and destroys the variety and elasticity essential in education; fails to tap all local talents and local resources for the development of a progressive curriculum; and above all, saps the initiative and experimentation at the grass root level which is vital on democratic and pedagogical principles.

Thus, there is a case for independent curricula at the State and local levels which are to be developed by the respective agencies to serve their own needs. The need for the involvement in curriculum making of three agencies namely the centre, the state and the local agencies, has never been more urgent; and this kind of trifocal responsibility has at no time been more important than today. In recent years it has been increasingly felt that centralized curriculum planning represents centralisation of education; and that, such centralisation is opposed to all democratic principles. Further, if the control of curriculum making is vested with the centre only, it is likely to be vitiated by the vested interests of the national agency connected with the process.

### **1.3.3 : State Model**

India is a vast country with a number of states, and some of these are as large as certain countries in the West. The states are spread from Kanyakumari to Kashmir, and from Assam to the Punjab; and among them there exists a wide variety in cultural, social, economic and developmental characteristics. The states are inhabited by various communities defined in terms of geography, history, language, religion, caste, creed and so on. As a result of all this, the needs and problems of a particular state and even of a particular social group within a state, are different from those of another state or of another group. Thus, from this point of view, India is a heterogeneous country. Therefore, an uniform curriculum can scarcely meet the varied needs and aspirations of people of all the states; and there should be different curricula for different states. The curriculum developed by the sources external to the state cannot be mandated on democratic principles; and hence, each state should develop its own independent curriculum.

### **1.3.4 : Local Model**

The fact that states vary in respect of its cultural, social, economic and developmental characteristics presupposes that such variations exist at the lower level of social organization and social groups too. It is a fact that India is a land of villages and about eighty per cent of it is formed by villages. Each village is unique as regards the needs and problems of its people. For instance, the needs and problems of people

living in fishing villages in Kerala are different from that of people living inland; and the needs and problems of tribals of Madhya Pradesh or Orissa are different from that of the sophisticated people of urban Bhopal or Bhubhneshwar. Therefore, a curriculum prepared at the national level or state level can hardly satisfy local needs; and there is a justification for a separate curriculum for a fishing community, a farm community etc., as well as for a rural curriculum and an urban curriculum. In other words, the curriculum should be different for different social groups defined in terms of their occupation, living locality etc.

### 1.3.5 : A Reconciliation among National, State and Local Models

The decentralized model of curriculum making as stated above, if operated effectively, would result in scores of curricula at the state level, and hundreds of curricula at the local level, each intended to meet the needs of a microscopic social group; and hence the importance of national curriculum as well as the need for a certain amount of central control in curriculum development. The curriculum at the local level should fit in well in that at the state level; and the curriculum at the state level should fit in well in that at the national level.

### 1.3.6 : Test yourself

1. State the agencies in India which are connected with curriculum development at the national level and at the state level?
2. (a) Explain the role played by these agencies in curriculum development.  
(b) Evaluate the contribution of the following in the curriculum development in India :  
(i) NCERT  
(ii) UGC
3. Explain the constitutional provisions for the involvement of the central agencies in curriculum development in India.
4. How does central planning affect the development of a progressive curriculum?
5. Why should curriculum be developed at the following levels?  
(a) State level.  
(b) Local level.
6. State how the curriculum at the national level differs from that at the state and local levels.
7. Distinguish between the curriculum developed at the following pairs of levels.  
(a) National level and state level.  
(b) National level and local level.

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- (c) State level and local level.
8. Which sources would you recommend to be tapped for developing a curriculum at the following levels ?
    - (a) State level.
    - (b) Local level.
  9. Outline the procedure recommended for cooperative planning in curriculum development at the following levels.
    - (a) National level.
    - (b) State level.
    - (c) Local level.
  10. To what extent does the curriculum at the local level satisfy national needs ?
  11. 'The curriculum developed at the State level is inadequate to meet national needs, and inappropriate to meet local needs.' Give reasons for each.

### 1.3.7 : Correct Answers

- Qn. 1. Ref. 1.3.1
- Qn. 2. Ref. 1.3.2
- Qn. 3. Ref. 1.3.2
- Qn. 4. Ref. 1.3.4
- Qn. 5. Ref. 1.3.5
- Qn. 6. Ref. 1.3.5
- Qn. 7. Ref. 1.3.2, 1.3.3, 1.3.4
- Qn. 8. Ref. 1.3.3, 1.3.4
- Qn. 9. Ref. 1.3.2, 1.3.3, 1.3.4
- Qn. 10. Ref. 1.3.5
- Qn. 11. Ref. 1.3.2, 1.3.3, 1.3.4, and 1.3.5

### 1.3.8 : Suggestions for further reading

1. Chandra, Arvind "Curriculum Development and Evaluation in Education", Delhi; Sterling publishers, 1977.
2. Golby Michael "Curriculum Designs" London ; The Open University Press, 1975.
3. Kerr John F. (Ed.) "Changing the curriculum", London ; UNI Books, University of London, 1974.
4. Leonard, J. Paul "Developing the Secondary School Curriculum", New York ; Holt, Rinehart and Winston, 1960.
5. Lewy Ariele "Planning the School Curriculum", Paris ; UNESCO, 1977.
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8. Wheeler, D.K. "Curriculum process", London ; University of London Press, 1967.



## MODULE 1.4

### CURRICULUM IN RELATION TO INDIVIDUAL, SOCIAL AND INSTRUCTIONAL OBJECTIVES

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#### 1.4.0 : Specific objectives of the Module

The students, after reading the Module, should be able to :

1. recognize the importance of the individual in society.
2. recognize the need for two categories of educational objectives
3. distinguish individual objectives from social objectives.
4. explain the individual and social objectives as reported by Indian education commissions.
5. describe the role of curriculum in achieving individual and social objectives.
6. identifies curricular programmes for achieving
  - (a) individual objectives, and
  - (b) social objectives
7. explain the relative importance of individual and social objectives in relation to the stages of education — primary, secondary and university.
8. recognize the relationship between educational objectives and instructional objectives.
9. define various instructional objectives.
10. describe the relative importance of various instructional objectives with reference to different types of curriculum units.

which the staff and the students obtain in academic, practical, aesthetic and vocational activities within and without the institution ; justice refers to the provision of courses to train students for all categories of jobs in administration, agriculture, engineering, teaching and so on ; and equality refers to curricular provision for meeting the special needs of all categories of students.

Kothari Commission, in its discussion on educational objectives, states that, "education cannot be considered in isolation or planned in a vacuum.....will, therefore, have to be related to the long term national aspirations, the programmes of national development on which the country is engaged and the difficult short term problems it is called upon to face"<sup>5</sup>. According to the Commission productivity, social and national integration, modernization, and cultural renaissance as well as the social, moral and the spiritual values are the long term natural aspirations ; and self-sufficiency in food, economic growth, full employment are the short term problems. Thus, the social objectives of education are threefold— to create a social order in conformity with the cultural heritage ; to meet the needs and aspirations of people ; and to solve the problems of national importance. These objectives have a number of curricular implications ; and to mention a few, the curriculum should provide for :

1. science as a basic component of education at all levels.
2. social studies at the school level, and the social sciences at the university level, both to emphasize emotional integration, and development of good citizenship.
3. major religions of the world, to emphasize moral and spiritual values through the teaching of their fundamental tenets.
4. work experiences as an integral part of general education.
5. vocational courses at the school level, and job oriented courses at the university level.

#### 1.4.4 : Related Questions

Are the individual and social objectives of education equally relevant at all stages of education ? What is the relative importance of these objectives in respect of the different levels of curriculum planning ? These questions have great relevance to curriculum development ; and hence they may be considered.

Normally an individual is of six to fourteen years, fifteen to eighteen years, and nineteenth to twentyfour years of age

5. Report of Education Commission (1964-66), Ministry of Education, Govt. of India, New Delhi, p. 12.



when he undergoes education at the primary, secondary, and university stages of education, respectively. At the primary stage, education attempts to mould the personality of the pupils in general, and to develop their physical, mental, emotional and social qualities in particular, as well as to meet their psycho-biological needs and problems. At the secondary stage, the individual is in the adolescent stage of development, and he passes through a period of psychological and social stress and strain and hence, the harmonious development of the personality is the goal of education. Thus, upto the end of the secondary stage, educational objectives are more concerned with the individual than with the society to which he belongs. At the university stage, the individual is an adult, if not he is passing from adolescence into adulthood. He is conscious of his responsibilities to society as much as to his own self and to the family to which he belongs. Further, he is aware of the needs and problems of the existing and emerging social order. At this stage, educational objectives are concerned more with the society than with the needs of the individual.

The social objectives emphasise different social aspects at different levels of curriculum planning. The objectives at the national level has a specific slant towards the needs of the entire nation, — namely national development and international understanding. The objectives at the State level, by and large, conform to those at national level; nevertheless, they are more concerned with the needs and problems of the State such as the development of regional language, the utilization of local resources, — say, natural, physical, and human resources for the development of agriculture, and local industries, and so on. This is true of objectives at the local level of planning too; and they give more emphasis to the needs and problems of social groups, — say, to eradicate superstitions, to universalise primary education, to liquidate illiteracy, to develop village industries, and so on.

#### **1.4.5 : A reconciliation between individual and social objectives**

It is a truism that the individual has no independent existence; and he is an integral part of the society. Similarly, no society exists without individuals. This relationship between the individual and society forms the basis of the same relationship between individual objectives and social objectives of education. In other words, the two categories of educational objectives are interdependent; and there is no contradiction between them.

#### **1.4.6 : Educational and Instructional objectives**

A classroom teacher normally has very little concern for educational



objectives. However, he intends that, when students pass through the process of education, they should become useful members of the society to which they belong; and further, when the process of instruction is over, they should behave differently from what they were doing before instruction. Therefore, the teacher attempts to bring about desirable changes in the behaviour of students—in their thinking, feeling and action. Thus, though educational objectives are not consciously in the day-to-day activities of the class, yet they are implied in the instructional objectives; and further, instructional objectives also pertain to the modification of behaviour.

Benjamin S. Bloom conceived instructional objectives in three domains—cognitive, affective and psycho-motor and further classified the objectives of the cognitive domain into six major classes—knowledge, comprehension, application, analysis, synthesis, and evaluation. In ultimate analysis the instructional objectives of all the three domains basically belong to two major behaviours—

1. the students acquire the knowledge.
2. the students develop ;
  - (a) understandings.
  - (b) ability to apply knowledge and understandings in new situations.
  - (c) appreciations.
  - (d) attitudes.
  - (e) skills.

#### 1.4.7 : Curriculum in relation to Instructional objectives

The instructional objectives are very comprehensive; and they encompass the entire gamut of human behaviour. Therefore, the curriculum should be broad-based; and it should include not only the routine subjects but also a variety of student activities, — academic, practical, social, and cultural. Academic activities include self-study, writing composition, creative activity and participation in discussion, debate, symposium, panel discussion, seminar, etc. Practical activities include work experience, framing picture, making models, laboratory work, projects, role play, dramatization, and collection of materials for museum, etc. While social activities include social work, student-self-government, gardening, picnic, excursion, regional study etc.; the cultural activities include music, dance, dramatics, painting sculpture etc. All these activities should find a significant place in the curriculum.

Every curriculum includes a number of units; and each unit attempts to achieve specific instructional objective or objectives. For instance a

unit on facts and figures attempts to achieve the objective of acquisition of knowledge ; and a unit on certain principles and phenomena attempts to develop understandings and ability to apply them to new situations. A unit in poetry, social studies, and map drawing in geography, attempts to develop appreciations, social attitudes, and skills, respectively.

#### 1.4.8 : Test yourself

1. Analyse the worth of the individual.
2. State the importance of the individual in society.
3. State the relationship between individual and social objectives of education.
4. Explain the relative emphasis on the individual and social objectives of education in relation to the following :
  - (a) Stages of education.
  - (b) Levels of curriculum planning.
5. Why should there be differences in emphasis on individual and social objectives according to different levels of education.
6. State the major features of a curriculum based on social objectives.
7. Explain the specific aspects that should be taken care of when a curriculum is framed for achieving individual objectives.
8. Distinguish a curriculum based on individual objectives from that based on social objectives.
9. To what extent does a curriculum based on social objectives contribute to the achievement of individual objectives ?
10.
  - (a) Can you have a curriculum based on individual objectives only ?
  - (b) If your answer to question 10 (a) is 'Yes', state its special features.
  - (c) If your answer to question 10 (a) is 'No', give reasons for your answer.
11. To what extent is the principle of "equality" emphasised in the existing school curriculum ?
12. Critically examine the existing school curriculum with reference to
  - (a) individual objectives.
  - (b) social objectives.
13. State a few behavioural objectives.
14. Illustrate change of behavioural objectives with the change in the content of lesson.
15. State the relative importance of behavioural objectives for the following curriculum units :
  - (a) A poetry in a regional language.



- (b) Solving problems in mathematics.
- (c) Doing experiments in science.
- (d) Studying the culture of a race.

#### 1.4.9 : Correct answers

Qn. 1 Ref. 1.4.1	Qn. 8 Ref. 1.4.5	Qn. 13 Ref. 1.4.4
Qn. 2 Ref. 1.4.2	Qn. 9 Ref. 1.4.3	Qn. 14 Ref. 1.4.7
Qn. 3 Ref. 1.4.3	Qn. 10 Ref. 1.4.4	Qn. 15 Ref. 1.4.7
Qn. 4 Ref. 1.4.4	Qn. 11 Ref. 1.4.4	
Qn. 5 Ref. 1.4.5	Qn. 12 Ref. 1.4.3	
Qn. 6 Ref. 1.4.5		
Qn. 7 Ref. 1.4.6		

#### 1.4.10 : Suggestions for further reading

1. Bloom, Benjamin, et. al. "Taxonomy of Educational Objectives". Handbook I Cognitive domain, New York, David Mackay, 1956.
2. Chandra, Arvind, "Curriculum Development and Evaluation in Education", Delhi ; Sterling Publishers, 1977.
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4. Lewy Arie, "Planning the School Curriculum", Paris : UNESCO, 1977.
5. OECD (CERI) "Handbook of Curriculum Development", Paris : 1975.
6. Patel, R.N. "Educational Evaluation--theory and practice," Bombay ; Himalaya Publishing House, 1978.
7. Wheeler, D.K. "Curriculum Process", London ; University of London Press, 1967.





## MODULE 1.5

### CURRICULUM IN RELATION TO CONTENT

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#### 1.5.0 : Specific Objectives of the Module

The students, after reading the Module, should be able to :

1. explain the concept of content of the curriculum.
2. state the relationship between content and curriculum.
3. distinguish the content from learning experiences.
4. describe the importance of content of curriculum.
5. relate,
  - (a) content and rational action.
  - (b) content and discovery of new knowledge.
6. explain the relationship between ;
  - (a) content and individual objectives.
  - (b) content and social objectives.
7. identify the major content areas in respect of :
  - (a) individual objectives.
  - (b) social objectives.
8. distinguish the content in respect of individual objectives from the content in respect of social objectives.
9. identify major subject areas of content.
10. anticipate the principle of selection and distribution of content.

### 1.5.1 : Concept of Content

In ultimate analysis the body of human knowledge is nothing but a lore of facts, concepts, generalizations, principles, processes, problems and so on; and these aspects are inter-related in the sense that the knowledge of one is necessary for understanding the other, and understanding enables an individual to detect errors, as well as gaps in knowledge, and also to discover new knowledge. The student learns these through mental operations consequent upon activities such as rote learning, discussion, drill, written expression, and so on. For instance, a student learns facts, concepts, definitions, processes, etc., regarding electricity through activities like reading books, solving problems, performing experiments, observing demonstration, making magnets and wiring lights. The former which includes facts, concepts, definitions etc., is known as the *content* of the curriculum (also known as knowledge), and the latter including rote learning, discussion, drill etc., is known as *learning experiences* of the curriculum. Thus, in the words of Taba, "the curriculum consists of two different things: the content and the learning experiences, or the mental operations the students employ in learning content. Although in the actual learning act the two are in constant interaction—one cannot deal with content without having a learning experience—for the purposes of establishing rational criteria two need to be distinguished"<sup>1</sup>.

### 1.5.2 : Importance of Content

The content is important for several reasons. In the first place, it is the basic determinant of the curriculum. In fact, the content determines the nature and kind of learning experiences that should be provided to students as well as the evaluation tools that should be employed. Further, it suggests all kinds of indoor and outdoor activities that the teacher should offer for learning the curriculum. Secondly, "knowledge is essential for rational action"; and without it the individual behaves in an irrational manner. Although the knowledge of content does not ensure rational action—because the individual may still act in a routine manner, or on the basis of traditionalism, emotionalism, and prejudice; without knowledge, rational action is impossible. Thirdly, "knowledge begets knowledge". In order to discover new facts, concepts, principles etc., one must possess certain amount of basic knowledge; and in its absence the individual groups in darkness. Fourthly, "knowledge expands experience". The awareness of the individual that he possesses knowledge motivates him to explore the natural, physical and social environments; and this enables

1. Hilda Taba, "Curriculum Development : Thoery and Practice". New York ; Harcourt, Bruce & World, Inc., 1962, p. 265.



him to acquire new experiences and better understanding of the experiences that he already possesses. The additional experience enables the individual to identify gaps in knowledge which may provide opportunities to him to fill them with his own discoveries or to others to do so. Thus, possession of knowledge enables the individual to push out the periphery of existing knowledge. Finally, knowledge satisfies the persistent need for cognitive orientation to life, and motivates him for further knowledge.

Suchman states, "the activity of gathering and processing information is exciting and pleasurable. The ability to assimilate discrepant events is intrinsically rewarding, and the construction of new conceptual models that enables one to find new meaning in old events creates in the learner a sense of power"<sup>2</sup>.

### 1.5.3: Content and Educational Objectives

The content of the curriculum is related to objectives of education; and as the objectives are two fold, the individual and social objectives; the content should be concerned with both these categories of objectives.

### 1.5.4: Individual Objectives and Content

Individual objectives of education are concerned with the harmonious development of human personality which encompasses on one hand the faiths and values that the individual upholds, and the psychological characteristics on the other. The faiths and values of the individual are, by and large, the same as that of the family and the society to which one belongs. Values also emerge in the interaction of the individual with others in the society. Therefore, the content of the curriculum should include items which would consolidate the faiths and values of the individual, for which it would not only attempt to perpetuate traditional faiths and values, but also give the lead for the development of those relevant to the emerging social order. Considering the psychological characteristics from four aspects, namely physical, mental, emotional, and social, it is true that the individual has certain physical capacities, mental abilities, personality traits, and social qualities. The content should include items that would contribute to the development of the following—physical growth and development as well as good health; mental abilities including knowledge, thinking and reasoning, attitudes, and skills; good personality traits; and good social behaviour in peer groups as well as in the community and society to which the individual belongs. All these imply that the content should include items pertaining to the following—

2. J. Richard Suchman, "The Child and the Inquiry Process". Washington, D.C.; Association for Supervision and Curriculum Development, 1964, p. 63



1. Human body, and maintenance of health.
2. Physical growth and development.
3. Languages—mother tongue, regional languages, national language, and foreign languages.
4. Religion and moral science.
5. Sciences pertaining to world of nature and world of materials :
  - (a) world of nature—plants and animals; both living and dead, existing far and near—natural regions—natural phenomena; mountains and oceans; climatic conditions; winds and cyclones; soils, rocks and volcanoes—natural and physical resources; vegetation; water; wind; minerals ; electricity etc.
  - (b) world of materials, qualities, characteristics etc.
6. Sciences pertaining to the world of men—the history of the growth and development of human society, human civilization, and human culture—classification of society, civilization, and culture on geographical, cultural, racial bases—distribution of men in the world—social trends, problems, and prospects—inter-communion among different societies and cultures, development of “one world”, problems of society and their solutions, as well as methods to find solutions.
7. Activities for the world of work.
8. Activities for leisure, recreation and entertainment.

### 1.5.5: Social Objectives and Content

Social objectives of education are concerned with the existing social order, the needs and aspirations of people, and social problems. The content of the curriculum should make students aware of all these as well as help to establish a good social order. Therefore, the content of the curriculum should include items pertaining to the following :

1. The basis of social order—cultural heritage—the basis of culture—factors contributing to culture—cultures of people in various regions of the world, their distinctive features—inter-dependence of cultures—cultural evolution.
2. Needs and aspirations of people :
  - (a) Biological needs—air, water, food etc., and how to procure them in good condition, and maintain them without pollution population growth and allied problems.
  - (b) Economic needs, economic growth and development; contributory factors of economic growth; factors arresting economic growth; measures for accelerating economic growth; economic development of various countries; inter-dependence of various countries for economic growth.

- (c) Aspirations of people — democracy, socialism, secularism, cultural renaissance, modernization, and productivity; the evolution of these in various countries; measures to meet the demands for these by people; factors arresting attempts to achieve these; factors contributing to their achievement—culture; tradition; political ideologies; sciences and technology and their applications in the daily life of the individual, and in the social, economic and industrial life.
- (3) problems of society :
  - (a) pollution of air, water, food, etc.
  - (b) Accommodation—slums; urbanisation; rural development.
  - (c) Poverty—reasons; solutions.
  - (d) Illiteracy; superstitions; outdated customs and conventions.
  - (e) Population growth; allied problems.
  - (f) Knowledge explosion; allied problems, cybernation.

The major areas of content, as stated above, are normally classified into a number of major subjects, and related ones :

- (1) Physical education, and health education.
- (2) Humanities—Literature; Language; Arts; Philosophy; Religion; History; and Anthropology.
- (3) Life sciences—Botany; Zoology; Marine Sciences; Physiology; Bacteriology; and Ecology.
- (4) Physical Sciences—Physics; Chemistry; Astronomy; and Geology.
- (5) Social Sciences—Economics; Sociology; and Politics.
- (6) Work experience; Crafts, including home craft; and vocational courses and job oriented courses.
- (7) Music; Dance; Dramatics; Painting; and Sculpture.

The subjects stated above cover the entire gamut of human knowledge; and the units regarding each subject form a sequence. The curriculum planner normally selects a specific number of units from subjects relevant to the stage of education, and organises them according to the level of the maturity of the students and other factors.

### 1.5.6 : Test Yourself

- 1. Define content.
- 2. How does content differ from curriculum ?
- 3. State the relationship between content and learning experiences.
- 4. Illustrate the nature of relationship between content and instructional objectives.
- 5. (a) Does the content in respect of individual objectives differ from the content in respect of social objectives ?



- (b) If your answer to question 5(a) is 'yes', state the distinguishing features for each curriculum.
- (c) If your answer to question 5(a) is 'no', give reasons for your answer.
6. State the major subject areas of content.
7. (a) Is there any difference in the content of curriculum for primary stage and secondary stage ?  
 (b) If your answer to question 7(a) is 'yes', state the differences between the two.  
 (c) If the answer to question 7(a) is 'no', give reasons.
8. (a) "subjects in primary stage curriculum are more or less the same as those in secondary stage curriculum". Do you agree?  
 (b) If your answer to question 8(a) is 'yes' give reasons.  
 (c) If your answer to question 8(a) is 'no', state the special features of each curriculum.

#### 1.5.7: Correct Answers

Qn. 1. Ref. 1.5.1	Qn. 7. Ref. 1.5.5
Qn. 2. Ref. 1.5.2	Qn. 8. Ref. 1.5.5
Qn. 3. Ref. 1.5.2	
Qn. 4. Ref. 1.5.3	
Qn. 5. Ref. 1.5.4	
Qn. 6. Ref. 1.5.4	

#### 1.5.8: Suggestions for Further Reading

1. Chandra, Arvind "Curriculum Development and Evaluation in Education", Delhi : Sterling Publishers, 1977.
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4. Krug, Edward A. "The Secondary School Curriculum", New York : Harper Brothers, 1968.
5. Hulla. B.P. and Darvi, D.R. "Curriculum Development in Secondary School", Baroda : CASE, 1966.
6. Patel, R.N. "Educational Evaluation—theory and practice", Bombay : Himalaya Publishing House, 1978.
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## SECTION 2.0

# CURRICULUM AND ITS ORGANIZATION

problems of towns and cities. Further, the problems of schools located in villages are concerned with accommodation, facilities such as laboratory and library, universal enrolment, wastage and stagnation, and so on. The problems of schools located in towns and cities are mainly concerned with space, building, accommodation, facilities, modern curriculum, qualified staff, and so on. The planner organizes the curriculum in such a way that the content would help to meet the requirements of different categories of students as those belonging to different socio-economic group and those living in villages, towns and cities, as well as to meet the problems of schools located in villages, towns and cities.

The existing curriculum prescribes the same courses, subjects, activities, and experiences irrespective of the varying needs of the students and of the communities to which they belong, and of the schools where they are to be implemented; and thus, the curriculum has no relevance to the needs of students, society and schools. In order to rectify this, the process of curriculum development should be localised; and every institution should be permitted to develop a curriculum of its own.

#### **2.1.6 : Principle of Readiness**

The classroom teacher is faced with two factors—the student on one hand, and the curriculum on the other. Students learn subjects when they are taught at the most appropriate time, that is, when they are ready to learn. Readiness, as a psychological construct, depends upon two factors—the learner and the environment. The first factor includes the biological maturity, the capacities and capabilities, values and goals self concept and aspirations, and previous learning in relation to the possession of knowledge, skills, and attitudes. The second factor includes the physical conditions of the classroom, the school climate and the process of teaching. The principle of readiness stipulates that the curriculum should be organized in such a way that it will be possible for the teacher to teach subjects at the appropriate time, that is when the learner would possess the biological maturity; psychological preparedness, the requisite knowledge, skills and attitudes. It would be ideal if the curriculum is organized on the basis of research evidences in these matters; but such evidences are scarcely available. Therefore, in actual practice, the planner organizes the curriculum on the basis of empirical evidences offered by classroom teachers or of psychological hunches, or by trial and error method. It is true that the Developmental Psychology offers the data regarding the pattern of development of children as well as the “normal” characteristics of children of different age groups. But, these data are not of much value in curriculum development for two reasons. The Developmental Psychology offers only the “normal” characteristics of



different groups of children, and not the characteristics of the individual child in a class. Further, the data available from Developmental Psychology cannot be used independently in curriculum development ; it should be supplemented by additional data regarding the cultural, social, and economic background of children.

### 2.1.7 : Principle of Flexibility

Education is concerned with two factors—the school, and the society ; and both these factors have certain characteristics of their own today. For instance, a school of today represents a cross section of society ; and its students come from different strata irrespective of caste, community, creed, religion, language, and affiliations to various social groups. The society of today is characterised by three explosions—explosion of knowledge in general, and of sciences and technology in particular ; explosion of population in general, and of student population in particular ; and explosion of expectations of society in general, and of students in particular. As a result of all these explosions, social changes are occurring in various aspects of human life, and that too at a rapid pace. As students interact with society, they acquire new experiences as well as a new structure of values, needs and problems. Therefore, a rigid curriculum which demands a mechanical adoption by the teacher, rarely meets the needs of its consumers. Therefore, the planner builds a certain amount of flexibility into the curriculum and in its implementation.

Flexibility in curriculum implies autonomy at three levels,—at the level of the school, at the level of the teacher, and at the level of students. As regards the first, the curriculum prescribes a variety of courses, say core courses and elective courses ; compulsory and optional courses ; academic, practical, and vocational biased courses ; and so on ; and also makes provision for the school to offer any course according to interests, needs and problems of students, the place where it is located, as well as to the facilities that it possesses. As regards the second, the curriculum offers autonomy to teachers to adopt any method, technique and device according to the capacities and capabilities of students, the classroom facilities, and school climate. As regards the third, the curriculum offers autonomy to students to select any course of his liking, and pursue education in the selected course as long as he desires to continue education.

Flexibility as stated above is conspicuous by its absence in the existing curriculum. The curriculum prescribes every detail of the subjects and topics to be taught, as well as the instructional materials such as teachers' guide, textbooks, and workbooks to be followed ; and as these are prescribed by the State, the teacher has very little freedom to deviate from them. The school also prescribes the same course, subjects and activities



and therefore, the students are constrained to undergo only these courses, as they have no option except the one offered in the school. As a result of all this, the teacher teaches textbooks rather than educating the students; and the students become a storehouse of textbookish knowledge, and are isolated from the world of work and of realities of life.

### 2.1.8 : Test Yourself

1. Bring out a case for effective organization of the curriculum.
2. State the various steps in curriculum organization.
3. 'Curriculum organization is a scientific process'—Substantiate this statement.
4. Briefly explain the following in relation to curriculum development.
  - (a) Psychological characteristics.
  - (b) Needs of society.
5. Critically examine the importance of various sources for curriculum development.
6. How would you organise the curriculum to realize its value to the individual in his personal and social life?
7. What are the adverse effects of a uniform curriculum on students?
8.
  - (a) To what extent is the existing curriculum satisfactory on the following principles of curriculum development?
  - (b) What suggestions do you offer to improve the existing curriculum on the following principles of curriculum organisation?
    - (i) Principle of utility.
    - (ii) Principle of variety.
    - (iii) Principle of need.
    - (iv) Principle of readiness.
    - (v) Principle of relevance.
    - (vi) Principle of flexibility.
9. State the concept of 'relevance' at three levels.
10. Relate the concepts of 'autonomy' and 'flexibility' in relation to curriculum organisation.
11. How are the following concepts important in curriculum organization?
  - (a) Sequence.
  - (b) Continuity.
12. Should there be flexibility, even when the curriculum is built on other principles? Give reasons for your answer.
13.
  - (a) Distinguish between the curricula organised on following sets of principles.

- (b) Explain how the curriculum organized on the first principle can draw from the one organized on the second principle in each set.
- Principle of utility and principle of variety.
  - Principle of need and principle of readiness.
  - Principle of relevance and principle of flexibility.
14. To what extent does the curriculum organized on the principle of variety resemble the one organized on the principle of need ?
15. Explain the relative importance of the principles of utility, variety and relevance with reference to the inclusion of each of the following subjects in the secondary school curriculum.
- Mathematics.
  - Science.
  - Social studies.
16. On what principle of curriculum organization would you justify the study of the following subjects in Standards VI—VIII ?
- New mathematics.
  - Nuclear fission.
  - Marine sciences.

### 2.1.9 : Correct Answers

Q. No. 1	Ref. 2.1.1	Q. No. 9	Ref. 2.1.6
Q. No. 2	Ref. 2.1.1	Q. No. 10	Ref. 2.1.7
Q. No. 3	Ref. 2.1.1	Q. No. 11	Ref. 2.1.7
Q. No. 4	Ref. 2.1.2	Q. No. 12	Ref. 2.1.7
Q. No. 5	Ref. 2.1.3	Q. No. 13	Ref. 2.1.4
Q. No. 6	Ref. 2.1.4	Q. No. 14	Ref. 2.1.3
Q. No. 7	Ref. 2.1.5	Q. No. 15	Ref. 2.1.1
Q. No. 8	Ref. 2.1.5	Q. No. 16	Ref. 2.1.1

### 2.1.10 : Suggestions for Further Reading

- Chandra, Arvind "Curriculum Development and Evaluation in Education", Delhi : Sterling Publishers, 1977.
- Fleming, Robert(s) "Curriculum for today's boys and girls", New York, Harper and Row, 1964.
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## MODULE 2.2

### INTEGRATION, ARTICULATION AND COHERENCE IN CURRICULUM

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#### 2.2.0 : Specific Objectives of the Module

The students, after reading the Module, should be able to :

1. recognize the concept of curriculum.
2. explain the defects of the existing curriculum—fragmentalism, formalism, and traditionalism.
3. recognize the need for organising the curriculum on the principles of integration, articulation, and coherence to rectify the defects of the existing curriculum.
4. identify different kinds of integration, articulation, and coherence.
5. explain the following :
  - (a) need-based curriculum.
  - (b) problem-based curriculum.
  - (c) ideology-based curriculum.
  - (d) curricula-based on the principle of integration of different types—summative, contributive, fusion, linear, cyclic and holistic.
6. distinguish the following :
  - (a) personal integration from pedagogical integration.
  - (b) functional integration from structural integration.



- (c) intrinsic integration from extrinsic integration.
- (d) quantitative integration from qualitative integration.
- 7. compare the principle of integration with the
  - (a) principle of articulation.
  - (b) principle of coherence.
- 8. illustrate different kinds of integration from the following :
  - (a) Reports of Education Commissions.
  - (b) Contributions of educationists.
- 9. identify the advantages and limitations of curriculum organized on the principles of integration, articulation, and coherence
- 10. explain the implications of integration, articulation and coherence in relation to the existing curriculum.
- 11. analyse the existing curriculum on the principles of integration, articulation, and coherence.
- 12. suggest improvements to the existing curriculum on the basis of the principles of integration, articulation and coherence.

### 2.2.1 : Concept of Integration and its Need

The traditional curriculum is organized in the subject model; and it includes a number of subjects such as Mathematics, Physics, Chemistry, Botany, Zoology, History, Economics, Civics, and so on. Each of these subjects includes a number of units like Arithmetic, Algebra, Geometry, Trigonometry in Mathematics; Ancient History, Medieval History and Modern History and so on; and each unit includes a number of sub-units like Fundamental operations, Income tax, Commercial tax, etc. Each subject in the curriculum, each unit in a subject, and each sub-unit in a unit, exists independent of, and uncontaminated by parallel ones. Thus, the curriculum is characterised by too much of fragmentation, formalism and traditionalism and as a result, it fails to fulfil its personal, social, and academic functions. Regarding the first, as the curriculum includes too many subjects, it fails to contribute towards unity of intellectual activities among themselves as well as unity of learning with life activities, and thus, it impedes harmonious development of human personality. Regarding the second, as the entire spectrum of subjects, subscribes to formal teaching, the curriculum perpetuates a dichotomy between learning and living in general, and the world of knowledge and the world of work in particular. Regarding the third, as the curriculum conserves traditional knowledge, it resists new knowledge being inducted into it; and thus, promotes a hiatus between itself and modern knowledge; and creates a cultural lag in education. Further, the curriculum fails to subscribe to the structure of knowledge as well as to

the so called "needs", and organizes the entire content matter around such experiences. The "integrated day" curriculum provides a variety of experiences and activities based on needs and interests of students ; and in fact, it stipulates the organization of the classroom on the same basis, as 'reading area', 'science area', 'art area' and so on. It breaks the barriers in the time table and requires students to move freely from one 'area' to another ; and thus, from one activity to another ; and to draw from different subject areas while they are engaged in an activity.

The need-based curriculum is charged with high motivation for learning and as a result, student learn not only the content but also concomitant learnings regarding values, skills, attitudes, appreciations, and so on. Thus, the curriculum helps to achieve ultimate goals of education. Nevertheless the curriculum has certain serious limitations. For instance, it is difficult to define the needs of individuals and of a group. As the curriculum focuses on needs of individuals, it may possibly fail to train students to shoulder social responsibilities. Further, needs as "organizing centres" may not help the planner to cover the entire content matter through certain specified activities. Above all, need-based curriculum discounts the structure of knowledge and method of discovery which are important aspects of any content area.

#### 2.2.6 : Extrinsic (problem-based) Integration

Education is a purposeful activity ; and the purpose is the achievement of good life. Education is defined as an activity of life, by life, and for life. According to White-head, "there is only one subject-matter for education, and that is life in all its manifestations".<sup>3</sup> It being so, the traditional curriculum bears little resemblance to life. Extrinsic (problem-based) integration is intended to counteract this defect.

Human life subsumes a number of problems of practical nature ; home and family life, food and hunger; health and safety, poverty and wealth, law and order, war and peace, race and immigration, pollution, conservation and so on are a few such problems which are the concern of contemporary society. Further, society is wedded to a number of ideologies; say democracy, economic development, national integration, self-reliance, and so on. In problem-based curriculum, the curriculum planner organizes the content matter around problems, or ideologies, like those specified earlier ; and the ultimate purpose is to make students aware of these problems and ideologies, and to enable them to find solutions to the problems or to achieve such ideologies.

3. A.N. Whitehead, "The Aims of Education", London, Ernest Bern Limited, 1966, p. 10.



### 2.2.7 : Quantitative and qualitative Integration

We have lost at any rate at the post-primary school our grip, on education. It has become a mass of uncoordinated subjects, chaos instead of a cosmos. For this we need to substitute a coordinated system whose ruling principle will be the making of human beings. Quantitative and qualitative integration is the answer to fragmentalism that characterises the existing curriculum. While quantitative integration deals with summative and contributive types, qualitative type deals with fusion, linear, cyclic, and holistic types.

### 2.2.8 : Summative type

In the traditional curriculum, Geography, History, Civics and Economics exist independently without each making any contribution to another. Referring to these, the Secondary Education Commission states, "the teaching of these separate subjects only imparts miscellaneous and unrelated information and does not throw light on, or provide insight into, social conditions and problems, or create the desire to improve the existing state of things".<sup>4</sup> In order to break the isolation of these subjects, the planner integrates their content into a comprehensive unit called 'social studies'; and this kind of integration is known as summative integration.

Summative integration refers to the organization of the content of such of those subjects having one to one relationship, coordinating the content of each with that of others, and avoiding duplication of materials. A curriculum organized on this principle provides a sum total of separate contributions from different areas of knowledge. At the school level, besides Social Studies, General Science (Physics, Chemistry, Botany and Zoology) is an illustration of summative integration. At the university level, following this principle, curriculum can be organised as Earth sciences (Geology, Geography) Behavioural sciences (Psychology, Sociology, Physical education), and Social sciences (Anthropology, Psychology, Sociology, Political Science, Economics).

Summative integration has several advantages. The curriculum helps to achieve objectives of education in general, and that of individual subjects in particular; for instance, General science provides the basic understanding and appreciation of scientific phenomena—physical, chemical and biological—required by an ordinary student for a fuller life, and also the fundamental principles necessary latter for specialization in science subjects. The Secondary Education Commission states that General science is essential "both from the point of students' adjustment

4. "Report of the Secondary Education Commission" (1952-53), New Delhi, Ministry of Education, Government of India, p. 76.



to their natural environment and of providing the proper background for the more specialized studies later''<sup>5</sup>. The Social studies curriculum enables students (a) to study the social life and the administrative organization of their village, town, state, and India as a whole among the peoples of the world in relation to the geographical environment and historical development ; (b) to learn the evolution of Indian civilization and nationalism in its relationship to the march of world civilization and movements ; and (c) to realize the "significant problems of living together in the modern world which range from the students' inter-personal problems to inter-group, inter-provincial and inter-national relationship''<sup>6</sup>. Further, the integrated curriculum emphasises understanding of subjects rather than learning by rote. It economises time ; because it avoids the repetition of topics in different subjects of the curriculum.

### 2.2.9 : Contributive type

In the traditional curriculum, any two subjects invariably have certain common elements ; and each has something to contribute to the other. For instance, Literature has the common element with History in it's historical background, with Politics in it's political background, and with Religion in it's religious background. Thus, within a vast range of subjects, every subject subscribes to small or large extent, to every other subject ; and thus, subsumes cross fertilization of ideas with others. Contributive type of integration is concerned with the organization of curriculum in such a way that the course content of a subject supplements that of another.

### 2.2.10 : Fusion type

Mathematics is a tool of sciences ; and the scientific method is indispensable for understanding certain aspects of every subject. Thus, inspite of their individualities, subjects in the traditional curriculum are inter-related on some common principle or mutual area of interest. Fusion type integration is concerned with the process of blending two or more subjects on the basis of common principles, processes etc. Molecular Physics, and Mathematical Economics are illustrations of such fusion type courses.

### 2.2.11 : Linear type

Each subject in a curriculum is an independent logical structure of content with its own distinctive concepts and procedures. Nevertheless,

5. Ibid. p. 77.

6. Ibid. p. 76.

it represents an internally coherent aspects of experience with potentiality to cross it's boundaries to form a cluster with other subjects, such as humanities (Literature, History, Geography, Social Sciences, Religion), and Sciences. The linear type integration refers to the organization of curriculum into a cluster of subjects, (or more than one cluster) in which the content respects the individuality of subjects as well as recognizes their interrelatedness.

### 2.2.12 : Cyclic type

Each subject has certain core or basic ideas ; and its content expands from this basic theme to its applications and other aspects. Cyclic type integration is concerned with the selection and presentation of certain aspects of knowledge in ways appropriate to the phases of development of the growing child and this is done in varying contexts and increasing level of difficulty. The spiral curriculum advocated by Bruner<sup>7</sup> and rhythm in education regarding the three stages of intellectual progress (stage of romance, stage of precision, and stage of generalization) conceived by whitehead,<sup>8</sup> are illustrations of cyclic type integration.

### 2.2.13 : Holistic type

Holistic type integration is concerned with the organization of curriculum starting with a general idea, or an overarching concept, and borrowing materials from various subjects in teaching it. Bruner<sup>9</sup> conceives a curriculum with the notion of man as the starting point. The New Zealand Post Primary Teachers' Association develops a curriculum with two basic ideas—empirical, and non-empirical studies ; and its curriculum includes five major areas—

1. Investigating the environment (Sciences, Geography).
2. Investigating human behaviour (History, Psychology, Economics).
3. Enquiring into Symbolic / Logical Relationships (Languages, Mathematics).
4. Self-expression/Communication (Art, Music, Literature, Physical education).
5. Analytical/Reflective studies (Philosophy, Sociology).

Warwick<sup>10</sup> starts with three basic ideas—man, environment, and inter-

7. Jerome S. Bruner. "The process of Education", Harvard University press, 1963, p. 82.
8. A.N. Whitehead. "The Aims of Education, London, Ernest Benn Limited, 1966, p. 10.
9. Jerome S. Bruner. "The Process of Education", Harvard University press, 1963, p. 33.
10. David Warwick, "Curriculum Construction and Design, (1) Uni. Books, University of London, 1975, p. 11.



action. From these, he derives mainly eight major sub-divisions—Communication, Human sciences, Practical work, Environmental sciences, Rural science, Quantitative expression, Creative studies, and Spiritual values.

#### **2.2.14 : Principles of Articulation**

As a principle of curriculum development, articulation is concerned with continuity, consistency and interdependence of curricular offerings of a specific grade or of successive grades ; and it exists in two forms—horizontal (latitudinal) articulation, and vertical (longitudinal) articulation.

In the subject mode of organization, as stated earlier, curriculum includes a variety of subjects with related experiences and activities. The content is organized into units of subjects, experiences and activities ; and these units are distributed, on the principle of sequence, to different Grades in a graded structure of education, and to different stages in an ungraded structure. Horizontal articulation refers to the organization of the content in such a way that each unit of a subject, or a subject in a Grade leads to parallel ones in the same Grade. Vertical articulation refers to the organization of the content in such a way that each subject and its units in a Grade lead to parallel ones in the successive Grade. Thus, as per the principle of articulation, the curriculum, from the kindergarten through secondary to the university, is a continuum ; and each part of it's content grows out of the preceding part ; and contributes to the subsequent parts of the content.

The principle of articulation helps to eliminate gaps in the knowledge between two units of a subject, and two subjects of the curriculum in the same Grade (or Stage) and those in different Grades (or Stages) ; and thus it contributes to effective learning.

#### **2.2.15 : Principle of Coherence**

As a principle of curriculum development, coherence intends to establish a relation between different units of the curriculum, with each unit and supporting and at no point contradicting one another. Thus, the principle intends to establish a harmony among all the units of the curriculum. The coherence in a curriculum exists at two levels—cognitive level, and organization level.

##### **2.2.15a : Cognitive level**

As stated earlier, the entire curriculum intends to develop cognitive abilities in respect of acquisition of knowledge, and development of understandings, ability to apply, skills, attitudes, appreciation, and so on ; and



each of these abilities is related to others, and the achievement of one contributes to the achievement of others ; and the achievement of all cognitive abilities contributes to the development of the entire human personality. The curriculum planner organizes the curriculum in such a way that it contributes to the achievement of all the abilities in a coherent manner ; and at no point, the curriculum content develops one or more abilities at the expense of others. For instance, curriculum is organized in such a way that learning of literature enables students not only to acquire vocabulary but also to develop positive attitude towards it ; and learning of sciences, not only to develop skills in doing experiments but also to appreciate the contribution of sciences towards civilization.

### 2.2.15b : Organizational level

The curriculum includes a number of subjects, and related experiences and activities. Each subject is related to others, and contributes to the learning of them. It is true of learning experiences and activities too ; and all this happens because, all subjects have their genesis in a unitary factor, namely life. The planner organizes the various units of the content in such a way that the development of each contributes to others, and no unit is a hindrance to the development of the other. Similarly the planner in organizing the curriculum establishes a harmony between the content and experiences, as well as content and activities. Thus, the organization level coherence exists at both the intra-subject and inter-subject levels.

### 2.2.16 : Test Yourself

1. Existing curriculum is said to be vitiated by the following :

- (a) too many subjects,
- (b) too much of formalism,
- (c) traditionalism.

State five practical steps that you would recommend to remedy each of the above defects.

2. How does the existing curriculum cause the following ?

- (a) Split personality.
- (b) Gap between learning and living.
- (c) Cultural lag.

3. Describe the following concepts regarding curriculum organization.

- (a) Integration.
- (b) Articulation.
- (c) Coherence.

4. To what extent can the curriculum organized on the principle of

pedagogical integration be a substitute for the curriculum organized on the principle of personal integration ?

5. Can a curriculum organized on the principle of intrinsic integration act as a substitute for a curriculum organized on the principle of extrinsic integration ? Give reasons for your answer.

6. Critically examine the existing school curriculum with reference to the following, Illustrate your points.

- (a) Personal integration.
- (b) Intrinsic integration.
- (c) Extrinsic integration.
- (d) Horizontal articulation.
- (e) Vertical articulation.
- (f) cognitive coherence.
- (g) Organizational coherence.

7. Choose a topic of your interest from the school curriculum and indicate how you would reorganize it on the principle of ;

- (a) intrinsic integration,
- (b) extrinsic integration,
- (c) horizontal articulation,
- (d) vertical articulation.

8. "Social studies is a promiscuous mixing of Geography, History, Economics and Civics". Do you agree with this statement ? Give reasons for your answer.

9. How is the principle of summative integration different from that of contributive integration ?

10. Discriminate between the following pairs of principles.

- (a) Contributive type integration, and fusion type integration.
- (b) Fusion type integration, and linear type integration.

11. How does 'rhythem in education' conceived by Whitehead illustrate cyclic type organization of curriculum ?

12. To what extent does the existing curriculum illustrate Bruner's concept of spiral curriculum ?

### 2.2.17 : Correct Answers

Qn. 1. Ref. 2.2.1

Qn. 2. Ref. 2.2.2

Qn. 3. Ref. 2.2.3

Qn. 4. Ref. 2.2.4

Qn. 5. Ref. 2.2.5

Qn. 6. Ref. 2.2.6

Qn. 7. Ref. 2.2.7

Qn. 8. Ref. 2.2.8

Qn. 9. Ref. 2.2.8

Qn. 10. Ref. 2.2.8

Qn. 11. Ref. 2.2.12

Qn. 12. Ref. 2.2.13

### 2.2.18 : Suggestions for Further Reading

1. Bent, Rudyard et al. "Secondary School Curriculum", Lexington'. U.S.A., D.C. Heath Company, 1969.



2. Heath, Robert (Ed.) "New Curricula," New York, Harper and Row, 1964.
3. Ingram, James B. "Curriculum Integration and Lifelong Education", Hamburg. UNESCO Institute of Education, 1979
4. Leonard, J. Paul. "Developing the Secondary School Curriculum", New York, Holt Rinehart & Winston, 1960.
5. Levy Arieh, "Planning the School Curriculum", Paris : UNESCO, 1977.
6. OECD (CERI) "Handbook on Curriculum Development", Paris, 1975.
7. Wheeler, D.K. "Curriculum Process", London : University of London press, 1967.



## MODULE 2.3

### APPROACHES TO CURRICULUM ORGANIZATION

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#### 2.3.0 : Specific Objectives of the Module

The Students, after reading the Module, should be able to :

1. explain the following concepts
  - (a) Integrative threads.
  - (b) Subjects.
  - (c) Disciplines.
2. identify the sources for the integrative threads
3.
  - (a) describe the procedure for organizing a curriculum.
  - (b) recognize the advantage and limitations of a curriculum organized on the basis of the following forms :
    - (i) Content-oriented form.
    - (ii) Structure-oriented form.
4. state activities/units of environment for organizing a curriculum on the basis of activity-based/environment-based approach
5.
  - (a) establish the relationships between curriculum trends in India.
  - (b) recognize the implications of the following in classroom teaching :
    - (i) Activity-based approach.
    - (ii) Environment-based approach.



6. state the implications of the following in organizing a curriculum
  - (a) Student activities.
  - (b) Heavy industries.
  - (c) Water pollution.
  - (d) Olympic games.
7. analyse the following activities for organizing a curriculum
  - (a) Agriculture.
  - (b) Khadi industries.
  - (c) Adulteration.
8. bring out the deficiencies of the subject-based approach to curriculum organization
9. suggest improvements for subject-based approach in curriculum organization
10. compare the following pairs of approaches in curriculum organization :
  - (a) Subject-based approach and activity-based approach.
  - (b) Subject-based approach and environment-based approach.
  - (c) Activity-based approach and environment-based approach.

### 2.3.1 : The Subject-based approach

The body of human knowledge is evidently a lore of facts, concepts, generalizations, principles, theories and so on. Although these elements of knowledge appear to be disparate bits of information, indeed, they are inherently interrelated; and thus, they offer the scope for organization among themselves into unified wholes. Therefore, from very early times, the curriculum planner has been identifying relationships among the various elements of knowledge, and organizing them in a logical manner into unified wholes. The relationships among various elements of knowledge were defined as "*integrated threads*"<sup>1</sup> by Bloom, and as "*organizing centres (elements)*"<sup>2</sup> by Goodlad. The organized knowledge is known as the "subject" or "discipline". In the subject-based approach, the curriculum planner identifies the "integrative threads" in the world of knowledge, and then organizes its elements in the form of subjects.

The integrative threads are of varied kinds—themes, strands, types, problems, events, place, chronology and so on. Usually these threads exist at three different levels—the broad and general level, the medium level, and the narrow and specific level. When they are at the broad level,

1. Benjamin S. Bloom, "Ideas, Problems and Methods of Inquiry", in *The Integration of Educational Experiences*, 57th Yearbook, Part III, National Society for the Study of Education (Chicago : University of Chicago Press, 1958), p. 91.
2. John I. Goodlad, *School Curriculum Reform in the United States* (New York : Fund for the Advancement of Education, 1964), pp. 53-59.

the planner organizes the curriculum into broad subject areas such as Linguistics, Mathematics, Physical sciences, Natural sciences, Behavioural sciences and so on ; and when they are at the medium level the planner organizes the curriculum into units of subjects such as English, Tamil, Arithmetic, Algebra, Astronomy and so on. When the integrative threads are narrow and specific, say, in the forms of genres and types, Literature is organized into essays, poetry, drama and fiction ; and when they are in the form of identifiable periods of literary developments, it is organized into independent sub-units regarding the Romantic period, the Victorian period, and the Modern period. When the integrative threads are narrow and specific, say, in the form of strands and topics, the planner organizes Mathematics into sub-units such as directed numbers, functions, equations, area of plane figures, volume of solids and so on.

The curriculum planner usually taps four sources to identify integrative threads ; and they are the opinions of experts who hold broad out-look on various disciplines ; suggestions of teachers with vast experience in teaching subjects ; instructional materials used in classes : and interest as well as academic, social, and cultural experiences of the students.

From the above it follows that, the world of knowledge comprises a number of subjects as well as a number of units in each subject, and sub-units in each unit ; and each of these is organized in a logical manner on the bases of the respective integrative threads. Further, all units and sub-units of a subject have a sequence and a gradation of their own. In this context it may be stated that in the process of curriculum-making, after having organized all subjects as well as all units and sub-units in each subject, the curriculum planner allots the content of a few of each of these categories to different stages of education in an ungraded structure, and to different grades in a graded structure.

In the subject-based approach, the knowledge in each subject is organized in a logical manner ; and usually it is done in two forms—content-oriented form, and structure oriented form. In the content-oriented form, the curriculum planner is more concerned with the one-to-one relationships among the various items of content, say, facts, ideas, principles etc. as well as with inter-unit, inter-sub-unit and inter-subject dimensions of these elements. In the structure-oriented form the planner is more concerned with the structure of the subject than with its content. Regarding this Saylor and Alexander states “the structure of a discipline is the set of fundamental generalizations, principles, rules, propositions, or basic abstractions that binds a field of knowledge into a unity, organizes this body of knowledge in a cohesive interrelated wholeness, fixes the limits of investigation and inclusion of knowledge for the discipline itself, and provides the basis for discovering what else exists within the field.



Structure defines and limits a field of study, organizes it for comprehension and manipulation, and generates new propositions and knowledge".<sup>3</sup> The structure oriented organization is adopted mainly in Mathematics, Sciences, Languages and Social studies. In Mathematics, the knowledge is organized around a few basic notions such as the "set", and all logical operations are done in "sets". The Physical Science Study Group organizes the entire high school Physics into a number of concepts such as energy, time and motion; and these concepts explain most of the physical phenomena within the experience of an ordinary student. Evaluating structural organization Saylor and Alexander makes certain pertinent observations.

"1. The school curriculum based on a structural organization has not been fully accepted by scholars in particular fields, nor by a great many teachers and other school curriculum planners. This fact in itself does not vitiate the approach, but suggests that schools do not necessarily need to jump on a curriculum bandwagon in order to have a valid content organization for these particular school subjects....."

"2. The organization of content in the disciplinary subjects on the basis of structure may—and probably does—militate against the proper emphasis on other goals of education that should be sought through these subject fields....."

"3. If a structural organization of the disciplines taught in the school curriculum is desirable, the task of preparing the materials and re-educating teachers to use them is a tremendous one—particularly if the disciplines are to be designed for the entire period of schooling, including the general education aspects of higher education....."

The history of curriculum development gives several approaches to curriculum organization; but none is more predominant over subject-based approach; and many factors account for its predominance. In the first place, subject-based approach is logical; and it helps to decide whether an element of knowledge is within a subject area or not. Secondly, it facilitates easy comprehension, and ensures longer retention of knowledge. Thirdly, the subject enables the learner to make an elaborate use of its content in learning other subjects; to analyse his experiences, and to reconstruct such experiences into a new organized body of knowledge; and above all, to discover new facts, principles, solutions to problems and so on. Saylor and Alexander pertinently states, the "mastery of a discipline provide a person with a capacity to do things, to see new

3. J. Galen Saylor and William M. Alexander, *Curriculum Planning for Modern Schools* (New York: Holt, Rinehart and Winston, Inc., 1966), p. 166.
4. J. Galen Saylor and William M. Alexander, *Curriculum Planning for Modern Schools*. op. cit., p. 186f.



*relationships, to formulate new principles for the guidance of further action, to propose new courses of behaviour, and to detect the erroneous, the unacceptable, or the false*".<sup>5</sup> Fourthly, the logical structure of the subject facilitates the development of intellectual abilities, and thus enables the individual to deal more effectively with life situations. Finally, the teacher finds it easy to teach a systematic body of knowledge rather than discrete, disparate and disorganized units.

Although the subject-based approach is universally adopted, it has several limitations. For instance as the knowledge is built around facts, concepts, ideas etc., a considerable amount of formalism governs the subject; and as the knowledge is organized into a logical structure, the subject is abstract in nature. Further, as the body of knowledge is organized into a number of distinct and different subject areas, subjects are not only isolated from experiences, but each subject is also insulated from another; and thus, fragmentation dominates the entire world of knowledge, which is detrimental to its own growth. Regarding this Saylor and Alexander state that the "learning is fragmented and segmented, so that pupils do not make full use of knowledge in other behaviour situations in which it may be appropriate".<sup>6</sup> In this context Dewey points out that, "the gulf between the mature or adult products and the experiences and abilities of the young is so wide that the very situation forbids much active participation by pupils in the development of what is taught".<sup>7</sup>

Many of the deficiencies stated above are not inherent in the subject-based approach of organization; and on the other hand, they are created by a misuse of the approach through wrong teaching. Many a time teachers handle subjects by totally ignoring students' experiences; and they employ more of 'black board and chalk' than student activities. It is a fact, that comparatively it is more difficult to identify suitable activities and experiences than to choose an appropriate textbook for teaching a subject. The limitations of subject-based approach for organization of curriculum can be minimized to a great extent by using suitable methods, techniques and devices of teaching.

### **2.3.2 : The Activity-based approach**

The life of an individual is a continuum in terms of activities. Accord-

5. J. Galen Saylor and William M. Alexander, Curriculum Planning for Modern Schools. op. cit., p. 165.
6. J. Galen Saylor and William M. Alexander, Curriculum Planning for Modern Schools. op. cit., p. 173.
7. J. Galen Saylor and William M. Alexander, Curriculum Planning for Modern Schools, op. cit., p. 173.

ing to Herbert Spencer, activities belong to these five categories :

1. activities which directly minister to self preservation ;
2. activities which indirectly minister to self preservation by securing the necessities of life ;
3. activities pertaining to the end of rearing and disciplining of offspring ;
4. activities involved in the maintenance of proper social and political relations ;
5. activities for the leisure part of life.<sup>8</sup>

The activities such as those stated above belong to two broad categories—those pertaining to the personal and social life of the individual and those pertaining to problems of society which demand solution. All activities, in ultimate analysis, reduce to a few which are characteristic of these two broad categories. In the activity-based approach, the curriculum planner selects a representative group of activities, and organizes the entire content matter around them. In this he takes special care to choose such of those activities which are suited to the stage of development and the respective psychological characteristics of the learner as well as the administrative pattern of institutions and their organizational problems

Fredrick and Farquear identify the following areas of curricular activities :

1. protecting life and health.
2. getting a living.
3. making a home.
4. expressing religious impulses.
5. satisfying the desire for beauty.
6. securing education.
7. cooperating in social and civic actions.
8. engaging in recreation.
9. improving material considerations.<sup>9</sup>

In India, Gandhiji formulated Basic education in the activity based approach and in the basic scheme, he organized the entire content around a single activity, namely the craft.

Activity-based approach has psychological, sociological and educational importance. From the psychological point of view, activities promote the development of the cognitive, affective and conative aspects

8. Herbert Spencer, *Education : Intellectual, Moral and Physical* (New York : Appleton Century Crofts, Inc., 1860), p. 13f.

9. O.I. Frederick and Lucille Farquear, "Areas of Human Activity", *Journal of Educational Research*, 301672-679 (May, 1937).



of human consciousness, in an integrated manner ; provide sense experiences and motor activities which form the basis of all knowledge, understandings and appreciation of one's environments ; gratify creative instinct ; and arrest non-creative tendencies of imagination like day-dreaming, and direct them through constructive channels. From the sociological point of view, activities familiarise students with social realities ; teach dignity of labour and cooperative effort ; promote emotional and national integration ; develop proper attitude to work ; and break the isolation of the world of learning from the world of work. From the educational point of view, activities provide opportunities for the development of faith in fundamental values, mental abilities, and practical skills, which are important for achieving objectives of education.

In the activity-based approach, the student is more concerned with activities than learning the curriculum content ; and as activities satisfy the natural propensities, he enjoys learning. Further, knowledge is a by product of activities ; and hence the student understands its import, and transfers knowledge to life activities when occasion demands. The curriculum familiarises the student with the problems of individual and social life ; and hence, he prepares himself to face the challenges of life. Activities facilitate the integration of a variety of subjects, and of units in the same subject, and thus, make it convenient for the teacher to cover a greater quantum of content in a limited time.

The activity approach demands better facilities in terms of space, accommodation, equipment, qualified teachers and so on, which an ordinary institutions may not normally possess. Further, in this approach of curriculum, learning may not be economical although it may appear to be effective, because activities require additional time and effort on the part of both the teachers and the taught. Above all the parents may not desire an early induction of their wards to activities which they are likely to face in real life ; and hence, they do not approve of activity-based curriculum.

### **2.3.3 : The Environment based approach**

The individual lives in physical, natural, social, and cultural environments. He is a part and parcel of the physical world of men and matter ; he lives amidst nature including vegetation, water, wind, and so on. He owes a membership in a social milieu ; and he has a cultural heritage. Naturally, the individual has more affinity towards a curriculum dealing with his own environment. In the environment-based approach, the curriculum planner selects units of environment, and organizes the entire content matter around these units. A few units with the corresponding

environment may be listed :

Physical environment	agricultural farms business centres industrial units
Natural environment	mountains oceans atmosphere
Social environment	market place theatre festival
Cultural environment	cultural centre a temple exhibition (cultural).

The environment based approach has psychological, sociological, and educational importance as well as advantages which accompany the activity based approach of the curriculum. Nevertheless, it has certain limitations. In the first place, it is not possible to organize the entire content matter of a subject on units of environments alone. Secondly, the usual practice of organization of the class, time table etc., does not suit environment-based approach of curriculum and, hence, problems are likely to arise in the implementation of the pattern. Thirdly, environment based approach causes distractions and interruptions in learning ; and unless the teacher takes special care, real learning may not take place. Finally, this approach may not be approved by the parents and the public, because it has no link with the subject based curriculum which is a significant part of the educational tradition.

#### 2.3.4 : Test yourself

1. Explain the concept of integrative threads.
2. Distinguish content-oriented form of organization from structural-oriented form of organization. Give illustrations.
3. State the advantages of the following :  
(a) Content-oriented form of organization.  
(b) Structural-oriented form of organization.
4. Briefly explain the reasons for the popularity of subject-based approach.
5. 'Deficiencies of subject-based approach of curriculum organization are not inherent, but they are created by teachers'. Substantiate this statement.
6. (a) Briefly explain the following :  
(b) How does the planner formulate a curriculum on the basis of the following approaches ?



- (i) activity-based approach.
  - (ii) environment-based approach.
7. How does a curriculum organized on the activity based approach differ from that organized on the basis of environment-based approach ?
  8. Explain the Basic scheme with reference to activity-based approach in curriculum organization.
  9. 'Activity-based approach of organization of curriculum is not popular though academically sound'. Give reasons.
  10. Explain the importance of environment-based approach of curriculum organization from the following points of view :
    - (a) Psychological point of view.
    - (b) Sociological point of view.
    - (c) Educational point of view.

### 2.3.5 : Correct Answers

Q. No. 1. Ref. 2.3.1	Q. No. 6. Ref. 2.3.3
Q. No. 2. Ref. 2.3.1	Q. No. 7. Ref. 2.3.3
Q. No. 3. Ref. 2.3.1	Q. No. 8. Ref. 2.3.2
Q. No. 4. Ref. 2.3.1	Q. No. 9. Ref. 2.3.2
Q. No. 5. Ref. 2.3.2	Q. No. 10. Ref. 2.3.3

### 2.3.6 : Suggestions for Further Reading

1. Alcorn, M.D. et. al. "Better Teaching in Secondary Schools", New York, Holt, Rinhart and Winston, 1964.
2. Chandra, Arvind. "Curriculum Development and Evaluation in Education", Delhi, Sterling Publishers, 1977.
3. Howson, Geoffrey. "Developing a new Curriculum" London, Heinemana, 1978.
4. Krug, Edward A. "The Secondary School curriculum", New York, Harper Brothers, 1968.
5. Lulla B.P. and Dalji, D.R. "Curriculum Development in Secondary Schools", Baroda, CASE, 1966.
6. Taba, Hilda, "Curriculum Development Theory and Practice," New York, Harcourt Bruce Company, 1962.
7. Warwick, David. "Curriculum Structure and Design", London, UNI Books, University of London, 1975.
8. Wheeler, D.K. "Curriculum Process," London, University of London Press Ltd., 1967.



## MODULE 2.4

### CURRICULUM DISTRIBUTION

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#### 2.4.1 : Areas of Curriculum

The curriculum is the heart of the teaching learning process. In order to develop a curriculum which is socially and personally relevant to the needs of the children and the society, it is essential to develop the different areas of curriculum well. Flexibility is urgently required not only to break the barriers but also to make teaching learning situation relevant to the life, needs and aspirations of the children and the community to which they belong. For a vast country like ours with the diversity of languages, social customs, manners, mores and uneven economic development, the needs and demands of the individuals and the society will have differential pulls on the school curriculum, varying from one region to the other. Learning experiences in schools arise out of subject teaching as well as other activities. Therefore, what subjects are to taught, what objectives are to be realised through each subject, what methods and material are to be used so as to provide the best possible experience to pupils and the resources available to the schools, the allocation of time to curricular and co-curricular activities and the distribution of time over various curricular areas need to be thought of in order to make the school curriculum more effective and meaningful.



### 2.4.2 : Stage-wise Objectives

The broad objectives of general education have a limited utility unless they are spelt out in terms of stage-wise and subject-wise objectives for the guidance of educational planners, administrators, supervisors and teachers. The objectives of primary education stage have to be different from the objectives of education at the middle and secondary stages of education. Similarly the teacher training programme for primary should differ from that for the pre-school as the objectives of primary education stage differ from those of the pre-school education. Similarly objectives of secondary teacher education programme have to be different from those of primary and pre-primary stages. The teacher education curriculum (N.C.T.E. 1978)<sup>1</sup> envisages the below mentioned objectives and structures of the pre-school stage, primary stage and secondary stage of teacher education.

#### Pre-Primary Stage

The pre-school trainee should :

- 4.3.1 Acquire theoretical and practical knowledge about early childhood education.
- 4.3.2 Develop understanding of the major principles of child growth and development with special reference to the environment of the child.
- 4.3.3 Apply the understanding and the knowledge to the education of young children under Indian conditions-rural, urban and industrial.
- 4.3.4 Develop skills, understanding, interests and attitudes which would enable him to foster all-round growth and development of the children under his care.
- 4.3.5 Develop skills of taking care of the physical and emotional health of young children by creating conducive environment.
- 4.3.6 Develop skills of communication, such as telling stories, explaining situations, etc.
- 4.3.7 Possess knowledge and develop skills of providing a variety of learning experiences through the organization of musical, rhythmical and dramatic activities, play, work-experience, creative art and games.
- 4.3.8 Possess skills of developing simple visual aids from waste and indigenous material.
- 4.3.9 Understand the home environment of the children and develop an amicable home-school relationship for mutual benefit.
- 4.3.10 Understand the role of the school and of the teacher in changing the society.

1. 'Teacher Education Curriculum—A frame work,' New Delhi : N.C.T.E., N.C.E.R.T 1978.

### Primary Stage

"The primary teacher-trainee should :

- 4.4.1 Possess competence in the first and the second language, mathematics, and in the topics of natural and social sciences related to environmental studies.
- 4.4.2 Development of skills in identifying, selecting and organizing learning experiences for teaching the above subjects in formal and non-formal situations.
- 4.4.3 Possess sufficient theoretical and practical knowledge of health, physical and recreational activities, work experience, art and music and skills for conducting these activities.
- 4.4.4 Develop understanding of the psychological principles underlying the growth and development of the children of the age-group 6 to 14.
- 4.4.5 Acquire theoretical and practical knowledge about childhood education including integrated teaching.
- 4.4.6 Develop understanding of major learning principles which help in promoting cognitive, psychomotor and attitudinal learnings.
- 4.4.7 Understand the role of the home, the peer group and the community in shaping the personality of the child, and help develop an amicable home-school relationship for mutual benefit.
- 4.4.8 Conduct simple action research.
- 4.4.9 Understand the role of the school and of the teacher in changing the society.

### Secondary Stage

"The Secondary teacher should :

- 4.5.1 Possess competence to teach subjects of his specialization on the basis of accepted principles of learning and teaching in the context of the new school curriculum.
- 4.5.2 Develop skills, understanding, interests and attitudes which would enable him to foster all-round growth and development of the children under his care.
- 4.5.3 Develop skills in identifying, selecting, improvising and organizing learning experiences for teaching the above-mentioned general and special subjects.
- 4.5.4 Develop understanding of psychological principles of growth and development, individual differences and similarities and cognitive, psychomotor and attitudinal learnings.
- 4.5.5 Develop skills in guiding and counselling the children in solving their personal as well as academic problems.



- 4.5.6 Understand the role of the home, the peer group and the community in shaping the personality of the child, and help develop an amicable home-school-relationship for mutual benefit.
- 4.5.7 Understand the role of the school in changing the society.
- 4.5.8 Undertake investigatory projects and action research.

### 2.4.3 : Subject-wise objectives

Having broadly defined the objectives of education at different stages, the next step is to plan learning experiences for their realization. Learning experiences in school arise out of subject teaching as well as other activities. Therefore, what subjects are to be taught, what objectives are to be realized, through each subject, what methods and materials are to be used so as to provide the best possible experience to pupils within the resources available to the schools, the allocation of time to curricular and co-curricular activities and the distribution of time over the various curricular areas need to be thought out, while planning subject-wise instructional objectives.

Some of the examples of the subject-wise objectives for classes IX and X are given as under :

#### History

##### *Objectives*

The main objectives of teaching this course may be as follow :

1. To promote an understanding of the processes of change and development through which human societies have evolved to their present stage of development.
2. To promote an understanding of the common roots of human civilizations and an appreciation of the basic unity of mankind.
3. To develop an appreciation of the contributions made by various cultures to the total heritage of mankind.
4. To foster the understanding the mutual interaction of various cultures has been an important factor in the progress of mankind.
5. To facilitate the study of the history of specific countries in relation to and as parts of the general history of mankind.

#### Geography

##### *Objectives*

1. To help students identify the varieties in the distribution of physical and economic phenomena over surface of the earth that are really associated and that give distinctive character to particular parts of the earth's surface.

2. To help students analyse the ways of living of the people all over the world and their problems in the light of their varying environments and their stages of economic and technological development.

3. To develop an appreciation of interdependence of various geographical regions.

4. To help students make generalizations with the help of geographical concepts, the knowledge of which is of great value in understanding, evaluating and reaching decisions about world problems.

## **Psychology**

### *Objectives*

1. To help the pupils develop an insight into their own behaviour.

2. To help the pupils understand and appreciate the behaviour of their fellow human beings.

3. To enable the pupils to use their knowledge of psychology in solving their personal and social problems and in learning in the school situation.

4. To help the pupils establish proper inter-personal relationship at home at school and in the society.

5. To help the pupils discover and develop their own potential abilities.

## **Citizenship education**

### *Objectives*

1. To promote an active and intelligent citizens who have the necessary civic competencies to participate in the community affairs effectively.

2. To develop an intelligent understanding of the structure and working of the civic and political institutions of India.

3. To help the students appreciate the role of United Nations and India's contributions towards maintenance of World Peace.

### **2.4.4 : Relative Weightage**

One of the major criticisms of our educational system and even of the teacher training institutions is that the cognitive goals of instruction have been given more relative weightage than the affective and the psychomotor domains. The teacher is supposed to look after the total development of the personality of the child, but his training programmes had rarely included educational experiences that could enable him to motivate the socio-emotional and moral development of the child. The teacher has to play a pivotal role of a leader inside and outside the classroom, and act as an agent of social change and thereby help in the



transformation of society and achieve the goal of national development. The 'Teacher Education Curriculum'<sup>2</sup> has suggested the below mentioned structure of secondary teacher education programme, grouped into three major theoretical and practical areas viz. A. Pedagogical Theory, B. Working with community, and C. Content-cum-Methodology of teaching school subjects and practice teaching. In order to make teacher education functional, it is essential that due attention may be given to develop a variety of core and special courses for the various stages of teacher education. Separate consideration may be given to rural and urban needs. These courses would comprise the subject matter drawn from different social sciences which could provide the trainee with fundamental knowledge and understanding of our social structure and its evolution through the ages, national goals, human nature, physical, mental, emotional and social growth and development of the children from early childhood to adulthood, learning, memory, attitudes, and human relations etc. Similarly the rationals for working with the community is to expose the teacher trainee to the complex socio-economic problems of the community through actual work-situations. This practical training can grow and develop his insight into, his sensitivity to and attitude towards social problems requiring solutions, it can help to develop his communication and practical skills in dealing with the people belonging to different socio-economic groups. These types of experiences in the new areas of work experience, moral education, art education, health, physical and re-creational education, vocationalization, and environmental studies may be ideal for imparting non-formal education to the community. It is very essential for effective teacher education and fulfilling the role of a teacher as an agent of social change and Community development. Similarly, the rationale under content-cum-methodology courses is to bridge the gulf between the content and methodology. It is very essential to develop core skills and specific skills necessary for teaching different subjects at different age levels, and for making our teacher education skill-oriented and functional. There is a need of integrating different subjects by way of developing interdisciplinary units in order to save time and to make teaching more meaningful.

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2. Ibid.

**Table-1 : Structure of Secondary Teacher Education Programme.**

(Two-Semester course of 36 credit-hours).

<i>Area</i>	<i>Weightage</i>	<i>Suggested Courses</i>
A. Pedagogical Theory	20%	1. Teacher and Education in the emerging Indian Society. 2. Educational Psychology. 3. Special courses according to the needs and facilities available.
B. Working with the community.	20%	4. Work situations related to 1, 6, 7, 8, and 9.
C. Content-cum-Methodology and practice teaching including related practical work	60%	5. Core training programme package (10%). 6. Special training programme package I : life Science/Physical Science/Social Science/Languages/Mathematics (20%). 7. Special training programme package II : work experience (10%). 8. Special training programme package III. Health, Physical Education games and recreational activities (10%). 9. Related Practical Work (10%)

**2.4.5 : Time Distribution**

It has been pointed out earlier that in order to bring education closer to life, it is necessary to introduce flexibility in the organization of school work and school hours. In an effective school education more meaningful time distribution over all the activities makes development of the child and functional. It also helps in the harmonious development of the child. As pointed out earlier, one of the major defects of instruction. It is very essential to make proper distribution of time for the affective and the psychomotor domains also. It is also of vital importance that there is a flexible time-table. In view of the fact that more than 80% of our primary schools are in rural area, the time distribution should be related to the rural needs. There is a need for more creative and joyful activities than formal instruction. Formal instruction must be reduced to a minimum in Pre & Primary classes. It should not be more than three



hours a day. Also keeping our Indian conditions in view such a reduction in the hours of formal instruction will be a boon in that trained teachers can be freed to teach at the pre-primary stage, to give help to dropouts who wish to re-enter the stream of formal education, to run second shifts in single teacher schools or to assist in programmes of adult education. As in many countries, help from other members of the community should also be obtained in organizing courses in activities in which such persons are interested, such as, gardening, cooking, physical education, etc. There should be no rigid time-table. Proper time distribution to various school activities should be related to childrens needs and community welfare.

Ishwarbhai J. Patel (Report of the review committee on the curriculum for the Ten-Year School) Ministry of Education (1977)<sup>3</sup> and Malcolm S. Adiseshiah (Report on higher secondary education with special reference to vocational education, for +2 stage) Ministry of Education, (1978)<sup>4</sup> suggest the distribution of time to various activities of school curriculum as given below.

#### 2.4.6 : Structure, Curriculum Pattern and Time Allocation

##### Classes. I-IV/V

	Time allocation
1. One Language	
2. Mathematics	20%
3. Environmental studies (Social Studies, Nature study and Health Education)	20%
4. Socially useful productive work.	20%
5. Games & Creative Activities such as, Music, sewing and painting.	20%

##### Classes V/VI-VII/VIII

	Time allocation (Per Work)
1. Languages	7 hours
2. Mathematics	4 hours
3. History, Civics and Geography	4 hours
4. Science-An Integrated course	4 hours
5. The Arts (Music, Dancing, Painting)	3 hours
6. Socially useful productive work and community service	6 hours

3. 'Report of the Review Committee, the Curriculum for the Ten year School, Ministry of Education, 1977.

4. 'Report of the National Review Committee on Higher Secondary Education,' 1978.

7. Games, physical education and supervised study	4 hours
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Total	32 hours.

Classes VIII/IX-X	Time allocation (per week)
1. Languages	8 hours
2. Mathematics	
Alternative-I	4 hours
or Alternative-II	
3. Science : Alternative I	5 hours
(Theory & Practical) Alternative II	
4. History, Civics and Geography—as one course.	3 hours
5. One of the following : The Arts (Music, Dancing, Painting, etc.) Home Science Agriculture, Commerce, Economics Social Reconstruction, Classical languages etc.	2 hours
6. Socially useful productive work and community service	6 hours
7. Games, physical education and supervised study	4 hours
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Total	32 hours

#### The pattern :

It is recommended that the pattern of the course and distribution of time for teaching two general Education Spectrum should be :

Course	Time distribution
1. Languages	15 per cent
2. Socially Useful Productive Work	15 "
3. Electives	70 "

It is recognised that this general scheme must be applied with a certain amount of flexibility, allowing individual states and territories and even individual schools to adapt the courses and the distribution of time to local conditions and pedagogic perceptions.

#### 2.4.7 : Structure of knowledge approaches

The structure of knowledge approaches are a recent development in curriculum designing and construction. The structure of knowledge approach answers questions pertaining to the construction of the course of



study rather than what courses should be offered in a high school and which ones should be in the curriculum of an individual pupil. Assuming that all pupils will pursue courses in language, social studies, mathematics and science, this approach is superior to others in selecting the content, the following three approaches are generally followed under it.

(a) The process approach, (b) The structure approach, (c) The humanistic approach.

#### **2.4.7 : (a) The process approach**

It is a combination of the pupil-culture, subject matter, and problem method; it is also referred to as the discovery of inquiry method. In each subject the curriculum constructors developed a manner of inquiry, and organize knowledge into a logically conceived and useful structure similar to a Taxonomy. If this mode of a investigation and structure are learned, then the student has the tools with which he can advance his own knowledge. Each skill acquired will be instrumental in helping him increase his knowledge and discover new factual information in his own way rather than by having to memorize large bodies of factual material. Processes are more important than factual information because they utilize it, classify and relate it, and give it meaning. Processes, then, is of a much higher order than facts and hence is retained more easily. This approach reinstates emphasis on content, for it is needed as a vehicle to teach processes. It also retains concern for the pupil. Motivation is secured by selecting processes, in relation to the maturation level of the pupil, which are of the greatest immediate interest and need. It also combines the content and pupil interest approaches because one of the major processes is that of acquiring skill in the solution of problems. The process approach also helps to maintain a balance between the cognitive, Psychomotor and affective types of objectives. The greatest emphasis is placed upon the development of mental skills. The pupils' emotional attitudes towards learning are considered and when found inadequate, attempts are made to modify them in appropriate directions. They are developed as concomitant outcomes. This approach also permits the organization of content into instructional units which may be built about a single topic with a single subject matter area, or it may transcend subject divisions.

Two of the processes which are applicable to any subject are : Communicating, discovering relationships and applying principles for problem solving; and analysing, gathering and organizing data for estimating, drawing conclusions or verifying.

**2.4.7. : (b) The structure approach**

Every discipline has a basic structure pattern in which its content is inter-related and organized. If this structure is known pupils will advance rapidly in the study of the subject and will have a clear understanding of it. Inter-relationships of concepts and major ideas are expressed as principles and generalizations which are derived from empirical studies of the field. Thus, the structure of a subject is learned when a student is able to see these relationships and express them in his own vocabulary as principles. Learning is advanced by applying the principles which will open new avenues, new insights, and lead to further information. Each student learns a mode of inquiry which is essential for the understanding and utilization of the structure approach. Factual information is first secured through various sensory methods, then relationships, concepts, principles, and generalizations are developed through analysis and synthesis, with a knowledge of the method of inquiry, and by expressing the processes and principles in symbols

**2.4.7 : (c) The humanistic approach**

This approach is a modification of the structure concept. The humanistic approach combines the structure of academic subjects and the needs, abilities, concerns, and interests of pupils. These factors can be employed in the selection of content, in motivation, and in helping pupils make wise choices of electives. After a student has embarked upon a course of study, the structure of the discipline, as well as the student's own interests and needs, will determine the content.

**2.4.8 : Curriculum Load**

The problem of curriculum load is a burning problem in curriculum implementation. It is a vital factor in teacher effectiveness. The Teacher Education Curriculum of N.C.T.E. referred to earlier has suggested a semester of twenty one working days, with a normal load of an average student to be 18 credit hours per semester. The present heavy work load hinders proper teacher participation in the co-curriculum activities. Similarly, the heavy curriculum load of various subjects undermines the activities of affective and Psychomotor domains. Ishwarbhai J. Patel in his aforesaid report of the Review committee on the curriculum for the ten year school, suggests work-load (Teaching only) of 20 hours per week for secondary department teachers and 18 hours plus 3 hours for correction and other work for primary level teachers. There is an urgent need of empirical studies on curriculum load and its impact on the effectiveness of curriculum implementation. The high percentage of school dropouts



demands that the heavy work load of our children also needs to be curtailed.

#### 2.4.9 : Test Yourself

Qn. 1. State the objectives of teaching the following subjects for class IX & X, and specify each objective in terms of at least three specifications :

- (a) Mathematics
- (b) History
- (c) Geography
- (d) Psychology

Qn. 2. Why time distribution is important in the school curriculum? Plan a time distribution chart of students at primary level.

Qn. 3. State briefly the importance of the curriculum load in the teaching learning process.

#### 2.4.10 : Correct Answers

- Qn. 1. Ref. 2.4.3
- Qn. 2. Ref. 2.4.5
- Qn. 3. Ref. 2.4.8

#### 2.4.11 : Suggestions for further Reading

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## MODULE 2.5

### DEVELOPING A CURRICULUM UNIT

#### 2.5.1 : Need

The curriculum development is the heart of any educational system. The curriculum must be capable of catering to the requirement of a wide range of the learners and learning circumstances. For making it an effective tool it has to be built around local situations, needs and environment. In more recent years, the meaning of the term curriculum has been broadened to encompass detailed plans of student activities, a variety of study materials, suggestions for learning strategies, arrangements for putting the programme into use, etc. Any learning activity will be relevant and interesting if it is based on the local needs and environment. The immediate surroundings of the child play a very important role as a basis of meaningful learning. Environmental approach is based on using environment for the development of learning skills, and makes the child an active participant in the teaching-learning process. It develops in the children the habit of finding out by various methods for more details about the topic they are studying than are available in the textbook. An environmental studies approach requires the teacher to evolve effective strategies based on personal, social and local environments.

For any major curriculum development the below mentioned stages are usually followed :



TABLE 2

<i>Stage</i>	<i>Activity</i>
(A) Planning outline	Selection of objectives. Selection of content. Selection of teaching-learning strategies.
(B) Preparing instructional material	Creation of instructional materials. Organization of materials into courses of study. Try-out of new materials. Modification on the basis of try-out results.
(C) Implementation	Dissemination. Setting of a logistic system. Teacher training. Adjustment of national examination system. Co-operation with administrative bodies. Quality control Recycling.

### 2.5.2 : Planning of Programme Outline

A programme outline is concerned with the determination of programme objectives, the selection of subject content to be learned and the selection of appropriate teaching-learning strategies. The final product of these activities is a programme outline. A detailed specification of objectives and content within a defined field of study is usually called a syllabus. It contains both the syllabus and the guidelines concerning learning strategies and learning activities to be used in the programme.

#### 2.5.2. : (a) Selection of Objectives

A curriculum aims at introducing a series of desired changes in the student's behaviour. These are the objectives of the programme. The selection of objectives should be based on local needs and environments. Decisions about curriculum objectives are affected by factors related to processes of contemporary life outside the school, the needs of the learner and the nature of the subject matter. Changes should be identified and the curriculum should ensure that young people acquire the skills and attitudes needed to cope with everyday living in the society. While formulating two lists of objectives the development team may utilise two types of screening criteria for producing the actual list of curricular objectives: (a) the values of the society; (b) Educational psychology. The development of objectives should

also be based on the classification scheme known as the taxonomy of Educational objectives, in which three domains are identified : (i) the cognitive, (ii) the affective and (iii) the psychomotor. In short the selection of objective has to be relevant to the real life, need and aspirations of the people. Community involvement is essential for removing the ills in the existing system of education to which only a small segment of our population is exposed. "The school is for the community and the community is for the School".

### 2.5.2 : (b) Selection of content

The selection of content should be related to educational objectives. It should be relevant to the needs of the learner. It should be based on cultural heritage and relevance to contemporary issues of our society, and provide opportunity for multiple learning activities. It should also provide a wide base and offer enough choice for further learning both in school and outside the school. There are various approaches to selection of content, viz. (a) The structure of discipline, (b) Basic themes or key concepts, (c) The example approach. A convenient model for guiding content planning is the objective content matrix. In such a matrix one dimension contains a list of the desired behaviours, or the behavioural objectives of the curriculum and the other dimension contains the content components of the programme. The list of objectives tell the curriculum developer the types of educational materials to be included.

### 2.5.3 : Teaching-Learning Strategies

The selection of appropriate teaching-learning strategy is a part of the functional curriculum development process. Keeping in view learners needs and environments, a curriculum may employ a variety of learning strategies, either as alternative modes for learning certain skills or as sequential activities for learning different sections of the same programme. There are two basic reasons for adopting a variety of teaching-learning strategies. First, a particular strategy may be effective for transmitting certain types of knowledge but less suitable for others. Second, some students may learn more easily with one particular strategy, while others may profit more from another one. Some of the general teaching-learning strategies are described below.

#### 2.5.3 : (a) Expository teaching

It is the straightforward transmission of information to students by means of printed materials or lecturers. In educational practice, both means are often simultaneously used with the same group of students. For example, a textbook might be used which is supplemented by



explanation of the material in the class by the teacher. Over the centuries expository teaching has been the most commonly used method in the classroom. This method of using both printed material and lecturing has several advantages like economy and flexibility. Despite the advantage of economy and flexibility, this mode of teaching-learning strategy has disadvantages like passive reception and dependence on others. It is less efficient in teaching higher mental functions such as comprehension, application, etc.

### 2.5.3 : (b) Inquiry learning

In this teaching-learning strategy, the students have to do more than passively absorb information to be repeated at the teacher's command. Instead, the student has to organise information in a meaningful way so as to provide solutions to particular problems or point out the structural relationship between various elements. Several expressions have been coined to denote variations of inquiry learning. These include "inductive learning", "discovery learning", "guided discovery learning" etc. While these terms are frequently used in the educational literature, there are no commonly accepted definitions to clearly differentiate between them. In the simplest inquiry assignments, the problem and the method for its solution are provided to the student. In a higher-level inquiry assignment, only the problem is given and the student has to select for himself an adequate method for arriving at a solution. Finally, at the highest level, the student has also to define the problem which is the subject of his inquiry. There are four major advantages of using this strategy : (a) intellectual potency, (b) motivation, (c) rules for solving problems and (d) more easily remembered. In recent times, the inquiry method has become a frequently used instructional strategy.

### 2.5.3 : (c) Small group teaching

This strategy involves the division of the class into small groups, each working independently. In such a situation the teacher is not the transmitter of knowledge but rather the co-ordinator of activities and a guide to information and processing. In a small group setting each student can assume an active role. He may participate in planning the learning task as well as in carrying it out. Small group teaching can be carried out in different ways : each group can be assigned the same task to perform, but it is also possible for a different assignment to be given to each one. A common class discussion of work presented by the various small groups may shed light on different aspects of the same phenomenon. Small group teaching requires the preparation of adequate curriculum material which can be used by the groups.

**2.5.3 : (d) Individualised learning**

Learning takes place within the individual. Its outcomes can be measured only by behavioural changes taking place in the individual. Many educational psychologists have recommended restructuring of the learning content in schools so that each student may work individually. The particular learning task and rate of progress should be determined separately for each individual. Such individualised instruction can be better tailored to the ability level and interest of each student. Two types of individualised learning may be introduced in schools (a) highly structured with learning kits (b) unstructured independent study.

**2.5.3 : (e) Learning for mastery**

A successfully applied technique for monitoring learning is the strategy of mastery learning. It is based on the assumption that the great majority of students are capable of mastering most of the learning objectives included in educational programmes, but that the amount of time needed for mastering a certain task and the type of cues which optimise learning results may vary from student to student. Instruction is carried out in regular classroom situations and the calendar time for progression from one topic to the next is the same for all students in the class. Upon completion of each learning unit, formative or diagnostic tests are administered in order to determine whether or not a student has achieved mastery. A well constructed diagnostic test points out the specific areas in which an individual needs supplementary learning. Students who have difficulty mastering a particular topic receive additional time and assistance so that they, too, may reach mastery level. They may be aided through a variety of corrective devices, such as individual tutoring, programmed instruction, repetition of previously learned material, etc.

**2.5.3 : (f) Games**

Games are usually employed as supplements to teaching strategies of other types. The advantages of game-type instruction are that it is intrinsically rewarding, the student wants to play the game well and therefore, willingly learns anything to increase his chances for success. Secondly, a game often constitutes a simplified representation of a complex real life situation ; it abstracts selected items from real life and thus enables the learner to master manipulation of these selected items one by one. Thirdly, a game requires active participation and, therefore, it is likely to be more efficient than passively receptive instruction. The following types of game strategies are frequently used in education (a) Role-playing, (b) Simulation and (c) Academic games.



### 2.5.3 : (g) Programmed Instruction

In programmed instruction the learning material is divided into small units which are called frames or steps. Each frame contains a single assignment requiring a sentence or a picture to be completed or a question to be answered. The advantages of this strategy are, first of all, attention is focussed on a small quantity of material at a time. Secondly, an active response to each question is required which facilitates learning. Thirdly, immediate knowledge of results (feed back) after each response enables the student to correct his errors and reinforces his response. Finally, such a strategy permits each student to proceed at his own pace. Programmed Instructional materials may be prepared in the form of printed matter or may be administered through the use of teaching machines or computers. The advantage of using teaching machine is that it prevents the student from looking for the solution to a problem without trying to provide the answer by himself first. Since a teaching machine or a computer programme can provide 'individualised feedback' the programme may be branched more easily, in different ways for different groups of students.

### 2.5.4 : Preparation of Instructional Material

The preparation of the instructional material is a vital component of the complete curriculum plan. If the teacher develops his own curriculum, he is likely to utilize products easily available in his environment for the preparation of the learning material. If the curriculum is developed by a central institute for a large population, items of various types will be assembled in a package. A teacher should explore a wide variety of materials to find suitable aids for instruction, to supplement what the textbook provides, to add to information, to broaden concepts and to arouse interest. All these materials and resources may be of various types, as follows :

#### 2.5.4 : (a) Textbooks

The textbook is, even today, probably the most commonly used learning material. A modern day textbook is no longer a self-contained book of knowledge, but rather one item among many required by the student in the process of learning. The textbook, though very important among the instructional aids, is not adequate in itself to help the child to acquire the expected learnings in terms of knowledge, understanding, skills, and attitudes. It needs to be supplemented by other aids like workbook, test items, charts, films etc.

**2.5.4 : (b) The teachers' guide**

The teachers' guide aims at helping the teacher to monitor the programme. Usually the guide alone is not sufficient preparation for the teacher and special training sessions are necessary. The major purpose of the teachers' guide is to provide detailed instructions for teaching each particular section of the programme. In addition it may contain background and enrichment materials as well, by way of suggestions for supplementary activity. It should contain the guidelines for programme usage. A bibliographical guide to relevant books and journals would be very useful. It should also contain a list of all the teaching aids.

**2.5.4 : (c) Diagnostic instruments**

Diagnostic instruments included in a programme kit, to be administered either by the teacher or the student himself, may serve the purposes of placement and monitoring. It may be used for determining whether the learner has mastered all the pre-requisites needed for studying a new curriculum unit. Should the diagnostic results show that a student is not ready for new materials, remedial learning activities can be provided. Upon completion of a sub-unit, the student can be given a formative test to determine whether he has mastered the topic or whether he requires more time for mastery.

**2.5.4 : (d) Classroom equipment**

Classroom equipment may contain three types of materials : demonstration materials, resources materials and group materials. Examples of demonstration materials are, posters, maps, slides, three-dimensional models, coins, plants, butterflies, insects, stuffed birds or small animals, and chemical and geological materials. The teacher explains their characteristics or uses them to illustrate a principle. Their major role is to serve as visual cues for recalling information.

Reference books, documents and data constitute resource materials. The students are requested to organise and analyse information derived from such sources. Certain types of instructional material are designed for group use only.

**2.5.4 : (e) Audio-Visual equipment**

Audio-visual equipment may be used to provide information of the type which would be difficult to present by any other means. A motion picture, videotape or phonograph records may constitute a part of classroom equipment though such materials, are often stored in a room or school equipment though such schools may borrow for classroom regional resource centre from which schools may borrow for classroom use. It is very useful to integrate audio-visual materials with classroom



instruction. To facilitate such integration the curriculum team may develop work sheets related to particular audio-visual materials, containing preparatory exercises for viewing or summary sheets to be filled out after the programme is over. Through television or radio programmes, the learner can see and hear or at least hear the most outstanding experts or leading personalities of social and intellectual life.

### **2.5.5 : Organization of Learning material**

Three major approaches are common concerning the organization of the learning material into courses of study ; these are the subject matter, core curriculum and activity approaches. In the activity approach, the students' interest prescribes the organization of the instructional materials. The teacher and students together frame the course, and the curriculum developer alone does not give its general structure. The most widespread way in which a curriculum is organized is around subject matter. During the past three decades most educational programmes have been structured according to the subject matter. The classics, the humanities, and the science disciplines have each been taught as separate courses. Recently, however, there has been an increasing trend to integrate several related disciplines into a single course. For instance, integrated science courses have been developed which cover all branches of science such as biology, chemistry and physics within the framework of a single course. Also course have been developed in social studies, linking together topics from history, geography, civics, economics, sociology, anthropology etc. Courses may also be organized around burning social problems or central themes and the relevant ideas from a variety of disciplines programmes of this type are frequently called core curriculum. With respect to the format of the materials, two major arrangements, are common ; the linear and the modular. In the linear format, units are arranged in a linear fashion according to a prescribed sequence. On the other hand, in a modular arrangement the teacher decides which portions of the programme are to be used and determines their order.

### **2.5.6 : Formative Evaluation of Curriculum material**

Instructional materials, even if developed by highly experienced and competent teams, need to be tried out in actual classroom situations before being released for general dissemination in an educational system. On the basis of empirical data collected during the process of programme developments, the curriculum team is able to improve the programme by changing or omitting or adding some learning activities, or by changing the sequence of the already existing learning activities. Evaluation activities should be performed throughout the whole process of pro-

programme development. The gathering of evidence while parts of a programme are still being developed is termed as formative evaluation. The formative evaluation of a programme generally consists of three consecutive stages : (a) prototype evaluation, (b) Preliminary try-out, and (c) field trial.

#### **2.5.6 : (a) Prototype evaluation**

Decisions are made about the types of learning activities which will be included in the programme at the very beginning of programme development. For example, for a seventh-grade physics course, it was decided that the students would use a precision scale to weigh various objects. The curriculum development team was not sure if children at that age would be able to use such an instrument easily, and therefore, they conducted a small-scale evaluation study, and on the basis of data collected, they found that children aged 12 are capable of using precision scale. On the basis of such evidence the team decided to keep it in the course of class VII. This type of evaluation is called prototype evaluation. Evaluation activity of this type generally deals with a category, or type of activity.

#### **2.5.6 : (b) The preliminary try-out**

The preliminary try-out of curriculum materials is performed when the first version of the programme is ready for use in the classroom. On the basis of prototype studies, the curriculum development team will have a good idea as to whether the programme in its totality will be likely to succeed. The curriculum team will try to find out what specific learning activities are difficult for the learner ?

As a result of analysing the data and collecting the results obtained, the curriculum team revises the programme and prepares a penultimate version which then will be subjected to field trial.

#### **2.5.6 : (c) The field trial**

The penultimate version of the programme is submitted to a field trial on a representative sample of the target population. Usually 40-50 classes are selected, depending upon the available resources and upon the homogeneity of the target population. The field trial is designed to examine the efficiency of the programme. At this stages the programme is almost in its final form and the conditions under which it is tested are more representative of those in the entire system than those of the preliminary try-out.

The following table explains the different stages of formative evaluation.



**TABLE 3**  
**Formative evaluation stages and their characteristics**

<i>Evaluation Stage</i>	<i>Programme Materials</i>	<i>Sample Size</i>	<i>Role</i>
Prototype	Typical components	1-2 classes	Selection of activities
Preliminary try-out	Provisional version of most components	4-6 classes	Modification of programme
Field trial	Penultimate version of all components	30-50 classes	Determinations of preconditions for programme use

#### **2.5.7 : Types of data used in Formative Evaluation**

The types of data used within the context of formative evaluation can be classified into three major categories : (a) Judgmental, (b) Observational and (c) Performance.

##### **2.5.7 : (a) Judgemental data**

The data provided by the opinion of the experts, teachers, parents, supervisors and students are called judgemental data. This material is gathered through the use of questionnaires and interviews. Questions are addressed to curriculum and subject matter experts; teachers and supervisors, and learners. One advantage of the judgemental data is that they can be gathered with minimum difficulty and in shortest time.

##### **2.5.7 : (b) Observational data**

Observational data are collected through systematic observation of the teaching/learning situations in the classrooms or elsewhere. Trained observers record their observations either in a free manner, or according to structured and pre-determined categories. Observational data are used to determine how the curriculum materials and procedures are actually employed in the classroom and whether they fit the criteria or specifications drawn out by the curriculum team.

##### **2.5.7 : (c) Performance data**

This third type of data provides information regarding the central problem of curriculum development, that is, what is learned by the

students, when the curriculum material and methods are used properly. Generally tests of this sort are developed after careful analysis of both the learning objectives of the programme and the actual curriculum material. The data provide the most direct evidence about the effectiveness of the curriculum material and methods, and as a result they can serve to support or negate the conclusions drawn from the other types of data which are collected at an earlier stage. For formative evaluation, the use of criterion-referenced tests is recommended. Each item in such a test represents a well-defined and specific behavioural objective. It enables one to determine if a student has mastered the particular objective or not. It enables us to know the weak points of the programme and what portions of the programme require further revision.

### **2.5.8 : Implementation of a new Programme**

The success or failure of any programme depends upon its proper implementation. Good innovative programmes have failed in the past because of flaws in implementation. Implementation needs careful planning and monitoring. While development of a programme is usually conducted in a single development centre by a relatively small team, implementation may require contact with hundreds of schools, thousands of teachers and tens of thousands of students.

#### **2.5.8 : (a) Logistics**

Programme implementation requires the establishment of adequate logistics network to ensure timely delivery of essential supplies and equipment to all schools. Irregularities in the delivery of necessary supplies to the schools may undermine the implementation of the programme ; The non-arrival of textbook at the beginning of the session may upset the learning climate. In many curriculum projects, inadequate supply of the teachers' guide causes serious problems in its proper implementation. A more serious handicap is the irregular supply of school equipment.

#### **2.5.8 : (b) In-service teacher training**

Most new programmes require additional training of the teachers. The recommendation of education commission (1964-66) is unequivocal in this regard. It reads as follows :

"A sound programme of professional education of teachers is essential for the qualitative improvement of education. Investment in teacher education can yield very rich dividends because the financial resources required are small when measured against the resulting improvements in the education of millions".



Care should be taken to motivate teachers to participate in in-service activities and to ensure the appropriateness of the level of such training activities. A comprehensive in-service training course should provide the teacher with the following :

- (a) Knowledge of the material, including the background of the subject matter, experience in working through the activities for themselves, information about how the materials were developed.
- (b) Understanding of the objectives and appreciation of the relationship between the learning experiences and the objectives.
- (c) Understanding of the teachers' role in using the programme, of the principles, of the class organisation and the kind of interactions intended.
- (d) Ability to monitor the progress of the pupils.
- (e) Opportunity for continuing development.

#### **2.5.8 : (c) Initial training**

Establishing good contact with teacher-training institutes is another task related to implementation, as it may facilitate the work of retraining. One way to secure the co-operation of teacher-training institutes is to involve them in decisions related to programme development and try-out. Indeed, such involvement may contribute not only to the implementation of the new programme, but also to improvement of the quality of teacher-training in general by increasing its relevance to the contemporary role of the teacher.

#### **2.5.8 : (d) Administrative bodies**

Dissemination of a new programme by means of direct contact with classroom teachers may result in friction between the teachers and their administrators. A school principal or an inspector can hardly be enthusiastic towards a programme about which he knows very little. The support of the school administration is very essential for successful programme implementation. Therefore, representatives of the administrative bodies should be involved in or consulted about the curriculum work from the beginning. There is also need of an orientation programme of school teachers, principals and inspectors about the total curriculum programme. Their suggestions for the implementation may be sought. This will smoothen the process of curriculum implementation.

#### **2.5.8 : (e) The role of examinations**

Standardised examination is an integral part of most of the educational systems. Such an examination may serve a variety of purposes. They may be held before the award of graduation diplomas or as a selective

measure to determine which students are qualified to proceed to a higher educational stage. It is well known that the form and the content of such examinations can exert a profound influence upon what is taught. Examinations can be good servants of an educational system, but they should never become its masters. In other words, the curriculum should dictate the content and objectives of examinations, and never the other way around. It is an unsound educational practice to allow an examination to determine what students should learn and, therefore, what they will be taught. It may indeed be of utmost national importance to seek reform in examinations in order to allow new educational objectives to be achieved. The reform in examinations plays a pivotal role in effective curriculum implementation.

### **2.5.9 : Organizational Alternatives**

The organisational structure of the dissemination network may be either centralised or decentralised. These two types of organizational structures ; as well as various patterns of content with teachers, is given below :

#### **2.5.9 : (a) The Centre-periphery model of dissemination**

The dissemination of a curriculum project can be conducted from a single curriculum centre. The activities for the most part will be directed by the curriculum centre, a horizontal division will be established of such tasks as logistics, teacher training, contact with administrative bodies, programme updating and evaluation. If the school system contains a large number of dissemination offices, and contact with the schools is through these regional offices, the internal organization of each regional office will reflect all that which exists at the curriculum centre, i.e., regional offices will provide all services to the schools. The danger of such a structure is that peripheral areas may get out of sight and control of the centre.

#### **2.5.9 : (b) The proliferation of centres**

Programme dissemination may be delegated completely to the regional offices. No co-ordination or control is left to a control office. Such an arrangement is advisable whenever there exist wide regional differences within a single school system, and also when well trained experts or professional workers are available in each region to aid in the implementation of the programme. Regional offices may be more suited for taking care of local needs and may exert better control over peripheral areas than a single central curriculum centre.



**2.5.9 : (c) Contact with teachers**

Regardless of the type of organizational structure those people in charge of implementation need to maintain close contact with the teachers who are using the programme in the classrooms. Contact can be maintained in several ways :

- (a) Through annual training seminars for all teachers just beginning to use the new programme. The duration of such seminars will be according to local needs and circumstances.
- (b) Through periodic meeting with all teachers (usually every few weeks) to discuss problems which arise.
- (c) Through a liaison person who is assigned to each school to help teachers in their work.

**2.5.10 : Monitoring and Recycling**

An educational programme which has been introduced into a system requires continuous monitoring. It is not enough to disseminate the programme and set the stage for its acceptance in the schools. Without taking care to update it, to provide supplementary materials, or to maintain control of the quality of its implementation, programme may deteriorate and lose its validity.

**2.5.10 : (a) Updating and supplementing**

Curriculum materials should be continually updated and supplemented. The task of the curriculum team does not end with the publication of the curriculum package ; new problems may emerge after it is in use, and it is the job of the curriculum team to cope with such problems. Teachers should be informed about any new developments in the subject matter which are relevant to topics including in the programme. Not only in the field of science are there rapid changes which must not be overlooked by an educational programme, but they are also there in social studies and humanities, continuous care should be taken to improve the equipment used in programme implementation. Teacher training programmes should also be modified on the basis of accumulated experiences.

**2.5.10 : (b) Quality control**

When a new curriculum or educational programme is implemented, the general expectation is that its effectiveness will increase with the passage of time. Teachers gain experience and adjust to the new programme or teaching method. Students also learn what is expected of them in a new curriculum. However, in some cases, an educational programme which may seemed effective during try-out stage and field

stages may prove inadequate at a later stage. An educational programme is said to have 'deteriorated' when it loses its effectiveness. Sometimes deterioration occurs only in particular schools or only in some subgroups of students. For example, a curriculum may become inadequate for students in rural schools, while it continues to operate well for students in urban schools. Deterioration has also taken place when only some objectives are met. Quality control should be conducted so as to find out whether or not a particular programme continues to be effective in attaining the specific educational objectives for which it is intended. When significant deterioration is noticed, it is important to determine what is the cause and what can be done to restore effectiveness. Without knowledge of the reasons for deterioration, it is very difficult to work out solutions to remedy it.

### 2.5.10 : (c) Recycling

Adequacy of a curriculum is a time bound concept. What may be adequate at one time may become inadequate later on. Changing conditions may call for a change in the foci of a programme. Contemporary developments in the subject matter may determine a shift of emphasis from old concepts to new ones, changes in social conditions and values and developments in educational technology may demand programmes different from those which are available at present and which have functioned well in the past. To keep abreast with changing demands a periodic re-examination of the curricula is necessary. A curriculum can be changed in two different ways. The changes may be brought about either gradually, step-by-step, or by complete renewal. A step-by-step alteration possesses many advantages. It is relatively easy to carry out and does not require new planning, since it utilizes the existing materials ; and improvement is attempted by eliminating the flaws and by updating and supplementing the remaining material. Such changes are, in fact, results of continuous formative evaluation activities

### 2.5.11 : Test yourself

Q. No. 1. What are the main stages for developing a curriculum unit ?

Q. No. 2. Why the preparation of Instructional materials is vital in curriculum implementation ?

Q. No. 3. How formative and summative evaluation helps in the effective use of curriculum ? Give some examples.

Q. No. 4. "The success or failure of any programme depends upon the proper implementation". Discuss briefly.



**2.5.12 : Correct Answers**

Qn. 1	Ref. 2.5.1 and 2.5.2	Qn. 2	Ref. 2.5.4
Qn. 3	Ref. 2.5.6	Qn. 4	Ref. 2.5.8

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SECTION 1

INSTRUCTIONAL OBJECTIVE

### SECTION 3.0

## CURRICULUM AND INSTRUCTIONAL OBJECTIVES



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## MODULE 3.1

### INSTRUCTIONAL OBJECTIVE

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#### 3.1 : Need

In any activity it is important that the performer knows what he is trying to do or where he is trying to go. Aimless behaviour seldom pays off in any desirable way. Teaching is no different from other human activities in this respect; unless it is well aimed, it is ineffectual, because the teachers and pupils do not know what they are trying to do. It is absolutely essential, therefore, that teachers learn to set clear objectives for themselves and their pupils. The objectives of education should determine the strategies and tactics that teachers use in their teaching. These objectives should be based on the nature of the learner, the nature of society and the nature of the subject matter to be considered, on the other hand, the subject matter or the content in a particular instance is part of the strategy and so should be selected in view of the objectives chosen for this instance. Educational method, consists of an intertwining of rather complex elements. To be a teacher at any level, therefore requires a good understanding of educational objectives, curriculum design and instructional strategy.

An instructional objective is a statement that describes what the pupil will do, or be able to do, it is hoped, once the instruction has been completed. It is a learning product that teacher hopes will result from the instruction, whether in a lesson, unit, course, or curriculum. It is



the terminal behaviour expected of the pupils at the conclusion of a period of learning. Instructional goals, then, are descriptions of the pupils terminal behaviour that it is expected will result from the instruction. If we examine the following list of objectives, we will easily see that some describe what pupils will be able to do at the end of the instruction, and some do not, only those that describe terminal behaviour of the pupils are instructional objectives, it does not matter what type of behaviour they describe as long as they describe a terminal behaviour. One source of confusion is that many writers of the behavioural objectives use the present tense rather than future tense. One would think that objectives would always be written in the future tense, because, after all, an objective is something one hopes to achieve in the future, but educational practices are not always logical.

These objectives were prepared by B. Ed. students for their teaching practice. Which ones describe terminal behaviour of pupils and are, therefore, behavioural objectives ?

- (i) The pupils will understand that vibrating bodies provide the source of all sounds and sound waves.
- (ii) Digestion is the chemical change of foods into particles that can be absorbed.
- (iii) The pupils will understand that the basic issues that resulted in secession was the extension of slavery.
- (iv) To explain what an acid is and what an acid's properties are.
- (v) Introduction to vector qualities and their use.
- (vi) The pupils will be able to convert temperatures recorded in Celsius scale to Fahrenheit.
- (vii) The pupils will appreciate the problems faced by those who emigrated from Europe to America.
- (viii) A Study of external features and internal organs of the frog through dissection.
- (ix) To discuss the reasons why the field of philosophy was so well developed by the ancient Greeks.
- (x) Animals' physical adaptation to their environment.

If you understand the principle that an instructional objective is one that describes pupil terminal behaviours, the following becomes obvious :

Objective I is an instructional objective, understanding is a kind of terminal behaviour. The objective is very broad, but it is still behavioural.

Objective II is not an instructional objective. It is a description of a concept. It does not describe terminal behaviour.

Objective III is an instructional objective. Understanding is a kind of behaviour and, in this case, understanding that slavery was the

basic issue that brought about secession is the terminal behaviour the teacher expects of the pupils.

Objective IV is not an instructional objective. It describes teacher behaviour rather than pupil terminal behaviour. It is more a teaching procedure than an objective.

Objective V is not an instructional objective. It is a topic or title. It is not an objective of any type.

Objective VI is an instructional objective. It describes what the pupils will be able to do at the end of the lesson; it describes the pupils' terminal behaviour.

Objective VII is an instructional objective. The terminal behaviour is vague and general; but it is a terminal behaviour.

Objective VIII is not an instructional objective. Rather, it is the title of a topic. It describes no behaviour of any kind.

Objective IX is not an instructional objective. It is not an objective at all but a description of the teaching procedure to be used.

Objective X is not an instructional objective. It is a title of a topic. It describes no behaviour and no objective.

### 3.1.2 : General and Specific Objectives

As you have seen, some instructional objectives are more general than others. Some objectives describe what it is hoped will be the ultimate goals of the entire educational programmes, for example :

As a result of their schooling, Indian youth will be good citizens; think clearly and rationally; use their leisure time worthily; live a healthier life; earn a good living at their vocations; appreciate beauty in art, nature, and the community.

Nothing could be more general than these objectives which are paraphrases of commonly cited major educational objectives. On the other hand some instructional objectives are astoundingly specific. For example : The class will understand how a rainbow is formed or the pupils will be able to differentiate between proper and improper fractions etc.

The general objectives are a combination of specific objectives. By achieving several specific objectives, we achieve a more general objective, which in turn contributes to the accomplishment of a still more general objective.

### 3.1.3 : The Taxonomy of Educational Objectives

If one is to judge the success of one's teaching, one must be able to measure educational progress in relationship to definite instructional goals.



All too often the educational goals described in literature are too vague for any practical purpose. The Taxonomy of Educational objectives is an attempt to classify definite kinds of specific objectives so that they will be usable for the teacher as he sets himself teaching tasks and as he evaluates the success of his and his pupils' efforts.

Generally, instructional objectives fall into three major categories or domains, the Cognitive domain, the Affective domain, the Psychomotor domain. Bloom and his associates have attempted to formulate taxonomies of instructional objectives for both the cognitive and affective domains. The cognitive goals were arranged into classifications from the lowest to the highest mental processes, according to the complexity of skills and abilities and to the objectives required. The affective domain was arranged into categories from lowest to highest according to degree of internalization of each of the objectives required. The proposed taxonomy of instructional objectives in the Psychomotor domain, as given by R.H. Dave, is based on the concept of co-ordination which runs as a common thread in the entire range of growth. Behaviours that belong to this domain include muscular action and require neuromuscular co-ordination. Instructional objectives belonging to this domain aim at the development of proficiency in performing such acts by affecting the best possible co-ordination between psychic and muscular action, and also between different muscular actions performed by various parts of the body.

The most important purposes of a taxonomy are :

- (a) To establish the accuracy of communication regarding the objectives of education.
- (b) To reduce the vagueness arising out of such loosely defined terms and concepts as "to know", "to reason", "understanding", "interest", etc. and to understand the relationship among them.
- (c) To become a means of a more precise communication system in the field of education.
- (d) To establish a common understanding about an hierarchical classification of objectives.
- (e) To become a means of understanding the sequence and organization of human development; and
- (f) To be a great help in clearly defining and meaningfully evaluating the educational standards of a school.
- (g) To bring uniformity in evaluation. Two evaluators or two teachers may interpret the various terms in their own way if the precise meaning of these terms is not communicated to them in the same way.

### 3.1.4 : Cognitive Domain

Bloom and his associates in this domain include those objectives which deal with thinking, knowing and problem solving. "The cognitive domain includes those objectives which deal with the recall or recognition of knowledge and the development of intellectual abilities and skills".<sup>1</sup> The taxonomy, containing six major classes or categories as proposed by Bloom and others is as follows :

**TABLE 4 : Cognitive Domain Taxonomy of Educational Objectives (Bloom 1956)<sup>1</sup>**

<u>KNOWLEDGE</u>	
1. Knowledge	
(a) Knowledge of Specifics	
(b) Knowledge of Terminology	
(c) Knowledge of Specific Facts	
(d) Knowledge of Ways and Means of Dealing with Specifics	
(e) Knowledge of Conventions	
(f) Knowledge of Trends and Sequences	
(g) Knowledge of classifications and categories	
(h) Knowledge of criteria	
(i) Knowledge of Methodology	
(j) Knowledge of the Universals and Abstractions in a Field	
(k) Knowledge of Principles and Generalizations	
(l) Knowledge of Theories and Structures	
<u>INTELLECTUAL ABILITIES AND SKILLS</u>	
2. Comprehension	
(a) Translation	
(b) Interpretation	
(c) Extrapolation	
3. Application	
4. Analysis	
(a) Analysis of Elements	
(b) Analysis of Relationships	
(c) Analysis of Organizational Principles	
5. Synthesis	
(a) Production of Unique Communication	
(b) Production of a Plan, on proposed set of operations	
(c) Derivation of a set of Abstract Relations	

1. Ben Jamin Bloom, et. al. "Taxonomy of Educational objectives". Handbook I Cognitive Domain, New York, David Mckay, 1956.



## 6. Evaluation

(a) Judgements in Terms of Internal Evidence

(b) Judgements in Terms of External Criteria

In the first category of this classification, knowledge is defined as almost synonymous with information. It involves the recall of specifics and universals, the recall of methods and processes or the remembering of a pattern, structure or setting. Objectives that emphasise memorization of facts, principles, processes and patterns in different subject areas fall under this category of the taxonomy. The second category of taxonomy is comprehension which is defined as the lowest level of understanding. It includes grasping of communication, accurately rendering the communication from one form of presentation into another, and re-organizing or summarizing the material without changing the central meaning. It also involves extra-polation or extension of trends and tendencies beyond the given data. The third category refers to application or use of general ideas, principles or methods to new situations. It is the unfamiliarity besides the problematic nature of a given situation that evokes this level of thinking process which is higher than mere comprehension, the fourth category analysis emphasizes the breakdown of the material into its constituent parts and the detection of the relationships of the parts and of the way they are organized. The fifth category in the taxonomy is synthesis, which signifies an ability of putting together parts or elements to form a cogent whole. It involves uniqueness, originality and creative behaviour, the last category is termed as evaluation. It is defined as the making of judgements about the worth, for some purpose, of ideas, works, solutions, methods, material, etc. It involves criteria as well as standards for appraising the extent to which particulars are accurate, effective, economical, or satisfying. The judgements may either be quantitative or qualitative, or the criteria may be either those determined by the students or those which are given to them.

### 3.1.5 : Affective Domain

The taxonomy of affective domain was prepared by Bloom, Krathwohl and Masia in 1964. "The affective domain includes those objectives which are concerned with changes in interest, attitudes and values and the development of appreciations and adjustment".<sup>2</sup> The taxonomy proposed by them has five major categories as given below :

TABLE 5 : Affective Domain Taxonomy of Educational Objectives (Krathwohl, Bloom, Masia, 1964)

#### 1. Receiving (Attending)

##### (a) Awareness

2. D.R. Krathwohl, et. al. "Taxonomy of Educational objectives." The classification of Educational goals. Handbook II. Affective Domain, New York, 1964.

- (b) Willingness to Receive
- (c) Controlled or Selected Attention
- 2. Responding
  - (a) Acquiescence in Responding
  - (b) Willingness to Respond
  - (c) Satisfaction in Response
- 3. Valuing
  - (a) Acceptance of a Value
  - (b) Preference for a Value
  - (c) Commitment
- 4. Organization
  - (a) Conceptualization of a value
  - (b) Organization of a value system
- 5. Characterization by a value or value complex
  - (a) Generalized Set
  - (b) Characterization

The first category under this domain is termed 'receiving' or 'attending'. It includes sensitivity to the existence of a certain phenomenon or stimulus, and the learner's willingness to receive or attend to it. This category includes awareness, which is almost a cognitive behaviour. It also includes willingness to receive or careful attention. The next higher form of behaviour within the same category is controlled or selected attention, which included an element of discrimination or differentiation of a given stimulus from others at a semi-conscious level. The second category is described as 'responding'. This is the category that many educationists will find, describes their 'interest' objectives the best. The third category 'valuing' includes the individual's commitment to a certain goal, idea or belief. The fourth category 'Organization' indicates the level at which the learner builds up a value system that includes his behaviour. The last category in this taxonomy is 'Characterization by a value or value complex'. At this stage of development, the individual acts assiduously and consistently in accordance with the values he has internalized. Finally, he attains an integration of his beliefs, ideas and attitudes into a total philosophy or world view.

### 3.1.6 : Psychomotor Domain

The psychomotor domain includes those objectives which deal with manual and motor skills. A comprehensive taxonomy of objectives in the psychomotor domain has not been completed, but both Simpson<sup>3</sup> and

3. E.J. Simpson : "The Classification of Educational Objectives : Psychomotor Domain, London, New York, Prentice Hall, 1966.



Kibler et al.<sup>4</sup> have begun a systematic classification in this area. Dr. R.H. Dave has proposed a taxonomy in the psychomotor domain in the form of a working hypothesis. Behaviour which includes muscular action and requires neuro-muscular co-ordination is grouped under this domain. The teacher's job is to provide such activities as may help develop neuro-muscular co-ordination. Educational objectives belonging to this domain aim at the development of proficiency in performing such acts by affecting the best possible co-ordination between psychic and muscular action, and also between different muscular actions performed by various parts of the body. As such co-ordination on the part of the learner increases, his actions become more refined, quick and automatic. The co-ordination is to be brought about among different parts of a given act or different acts to be performed with required articulation. The categories and sub-categories as proposed by Dr. R.H. Dave in the psychomotor domain are as follows :

TABLE 6 : Psychomotor Taxonomy of Educational Objectives (R.H. Dave)<sup>5</sup>

1. Imitation
  - (a) Impulsion
  - (b) Overt repetition
2. Manipulation
  - (a) Following direction
  - (b) Selection
  - (c) Fixation
3. Precision
  - (a) Reproduction
  - (b) Control
4. Articulation
  - (a) Sequence
  - (b) Harmony
5. Naturalization
  - (a) Automatism
  - (b) Interiorization

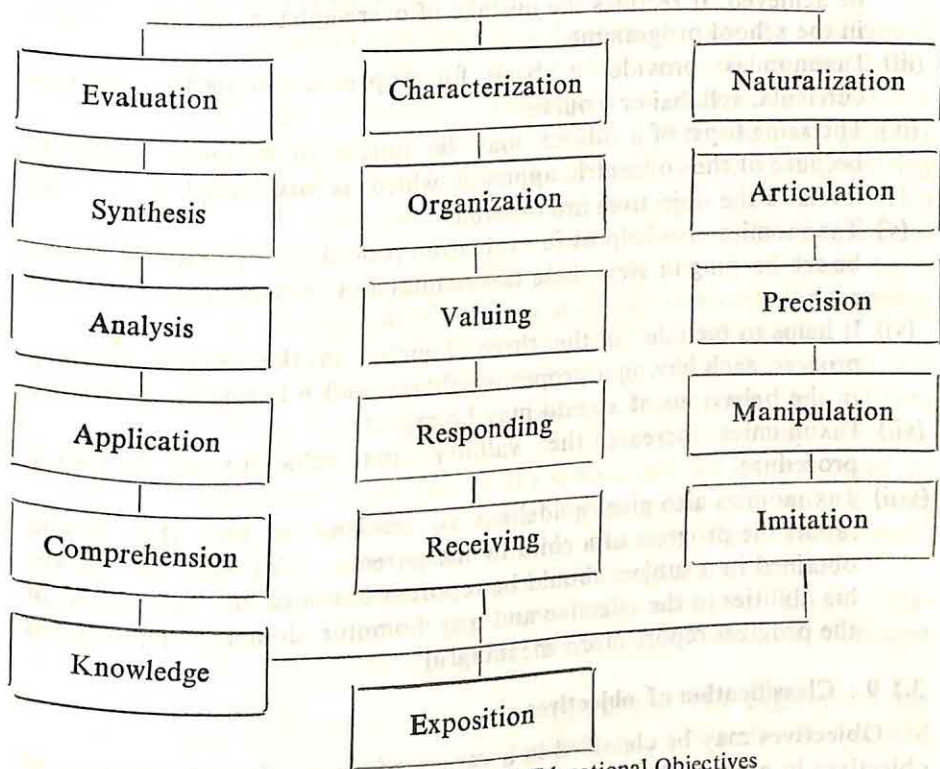
The first category of the above taxonomy is 'imitation'. Imitation begins with an inner rehearsal of the muscular system that is guided by an inner push or an impulse to imitate action. The second category 'manipulation', emphasizes the development of skill in following directions, performance of selected action and fixation of performance

4. Kibler, et. al. "Behaviour objectives and Instruction, John Willy & Sons New York, 1977.
5. R.H. Dave : "Taxonomy of Educational Objectives and Achievement Testing" in K. Ingenkamp (Ed.), "Development in Educational Testing," London, University of London Press, 1969, pp. 203-214.

through necessary practice. In the third category, called 'precision', the proficiency of performance reaches a higher level of refinement in reproducing a given act. Here, accuracy, proportion and exactness in performance become significant. The fourth category in the hierarchy refers to 'articulation'. It emphasizes the co-ordination of a series of acts by establishing appropriate sequence and accomplishing harmony or internal consistency among different acts. The fifth and final category refers to 'naturalization' of a single act or a series of articulated acts.

### 3.1.7 : Tripartite Structure

Having discussed the taxonomies of Cognitive, Affective and Psychomotor domains, it is now important to build up a tripartite structure to obtain a comprehensive classification scheme of educational objectives. The below mentioned Figure shows all the three taxonomies.



Tripartite taxonomic Scheme of Educational Objectives

It may be noted that 'exposition', as a starting point outside the taxonomic orders, has been added and is linked with each classification. This is because educational objectives describe expected outcomes of learning under one domain or another, and exposing the learner to an



educative experience starts the process of learning which leads to the achievement of these outcomes. It is therefore considered appropriate to use exposition as a first and preliminary step to construct a composite structure of tripartite taxonomies.

Thus the behaviour of a child is governed by his development in the three domains : Cognitive, affective and psychomotor, as shown in the above figure. All the three domains are equally important for the proper development of child's behaviour. Hence the teacher should put an equal emphasis on all the three domains in the whole educational process of evaluation.

### 3.1.8 : Role of Taxonomies in Curriculum and Evaluation

- (i) They help us in analysing and classifying objectives.
- (ii) They give us an idea of how the all-round development of a child can be achieved. It rectifies the mistake of overemphasis of one domain, in the school programme.
- (iii) Taxonomies provide a basis for a precise comparison of two curricula, syllabai or course.
- (iv) The same topic of a subject may be taught in different standards because of the concentric approach which is psychological but the levels of the objectives are different.
- (v) Taxonomies also help us in evaluation procedure. Questions are to be set keeping in view these taxonomies and the hierarchical order of each.
- (vi) It helps to include all the three domains in the teaching-learning process, each having a proper weightage, and a harmonious balance in the behaviour of a child may be expected.
- (vii) Taxonomies increase the validity and reliability of the testing procedure.
- (viii) Taxonomies also give guidelines to teachers on how they should report the progress of a child to his parents. Not only the marks obtained in a subject should be reported but also an evaluation of his abilities in the effective and psychomotor domain. This makes the progress report more meaningful.

### 3.1.9 : Classification of objectives

Objectives may be classified in a variety of ways. The classification of objectives in a particular dimension emphasizes the dominance of objectives in that dimension rather than the total exclusion of other objectives from the classified dimension. This is so because one's abilities do not develop compartment-wise. Elliot remarks "If one were to rank the various beliefs or assumptions in the field of curriculum that are thought most secure, the

belief in the need for clarity and specificity in stating educational objectives would surely rank among the highest. Educational objectives, it is argued, need to be clearly specified for at least three reasons. First, because they provide the goals toward which the curriculum is aimed; second, because once clearly stated they facilitate the selection and organization of content; third, because when specified in both, behavioural and content terms, they make it possible to evaluate the outcomes of the curriculum."<sup>6</sup> Objectives may be classified, broadly, (a) area-wise (b) subject-wise and (c) unit wise.

The broad objectives of general education have a limited utility unless they are spelt out in terms of area-wise, subject-wise, and unit-wise objectives for the guidance of educational planners, administrators, supervisors and teachers.

### 3.1.10 : Area-wise objectives

The curriculum should take into consideration the social, intellectual, emotional, and physical maturity of the child as well as the socio-economic needs of the community. The objectives of primary education, differ from secondary and university education. This stage of primary education covers, roughly, the children of age level 6 + to 11 + studying in classes I to V. In some parts the age level may be 5 + to 10 +. This is a very crucial stage in the life of a child. The child's spontaneity, curiosity, creativity and activity, in general, should not be restricted by a rigid and unattractive method of teaching and environment for learning. There should be enough scope for flexibility and local adjustment.

The classes VI to VIII cover the Middle stage when the normal age level should be from 11 + to 14+. During these years the children become adolescent and this period can be difficult for many children. Problems of adjustment in the family, the school and the society begin to appear. The child, however, becomes a boy or a girl with greater intellectual, emotional, social and physical maturity than the primary school child. Social demands and responsibilities begin to appear.

Similarly the major objective of our secondary education is its vocationalization, if it has to play a positive part in the national development and the social change.

The National Council of Teacher Education (NCTE) highlighted the following objectives for making our Teacher Education functional and more relevant to the national development in particular.

"The future teacher should :

6. W. Eisner Elliot. "Educational Objectives : Help or Hindrance", School Review, Vol. 75, 1967, 250.



- (i) Develop Gandhian values of education such as non-violence, truthfulness, self-discipline, self reliance, dignity of labour.
- (ii) Perceive his role as an agent of social change in the community.
- (iii) Perceive his role not only as a leader of the children but also that of a guide to the community.
- (iv) Act as a liaison between the school and the community, and employ suitable ways and means for integrating community life and resources with school work.
- (v) Not only use but also help in the conservation of the environmental resources and preservation of historical monuments and other cultural heritage.
- (vi) Possess warm and positive attitude towards growing children and their academic, socio-economical and personal problems and skills to guide and counsel them.
- (vii) Develop an understanding of the objectives of school education in the Indian context and awareness of the role of the school in achieving the goals of building up a democratic, secular and socialist society.
- (viii) Develop understandings, interests, attitudes and skills which would enable him to foster all-round growth and development of the children under his care.
- (ix) Develop competence to teach on the basis of the accepted principles of learning and teaching.
- (x) Develop communication and psychomotor skills and abilities conducive to human relations for interacting with the children in order to promote learning inside and outside the classroom.
- (xi) Keep abreast of the latest knowledge of the subject-matter he is teaching and the techniques of teaching the same.
- (xii) Undertake action research and investigatory projects."

### 3.1.11 : Subject-wise Objectives

After having broadly defined the objectives of education in different areas, the next step is to plan learning experiences for their realization. Learning experiences in school arise out of subject learning as well as other activities. Hence, what subjects are to be taught, what objectives are to be realized through each subject, what instructional strategy is to be followed so as to provide the best possible experience to pupils within the resources available, and how the time is to be allocated and distributed to curricular and various co-curricular programmes have to be thought out. What should be evaluated, how often, by whom, and by what method also needs thinking over. The curriculum for the Ten-Year School highlights the objectives of mathematics education. Mathematics has helped man to

quantify ideas, to be precise and to utilize spatial concepts in his day to day living. Its place in the sciences and in the practical arts, from the informational and computational standpoints, as well as its cultural significances, make it indispensable in our life. In a society which is rapidly transforming itself into an industrial and technological society, mathematical literacy is essential for every citizen. The objectives of mathematics education at the school stage should be :

- (i) To enable the students to cultivate a mathematical way of thinking, i.e. in terms of carrying out experiments with numbers and geometric forms, making hypotheses verifying them with further observations and experiments generalizing them, trying to find proofs and making abstractions, etc.
- (ii) To enable the students to quantify their experience of the world around them and to understand the process of applying mathematics to real life problems.
- (iii) To enable the students to learn the basic structures of mathematics through unifying concepts and to motivate the learning of structures through applications and concrete situations.
- (iv) To stimulate the students to study mathematics on their own and to develop a taste and feeling for mathematics.

### 3.1.12 : Unit-wise Objectives

Similarly, the Unit-wise objectives will differ from each unit and subject. For unit-wise planning, we may have to keep the following general procedure in view :

- (a) Select the topic or theme to be studied.
- (b) Determine the general objectives for pupils.
- (c) Determine the specific objectives that will lead to general objectives.
- (d) Determine a sequence of pupil-teacher activities by which to attain the specific and general objectives.
- (e) Build a study-guide for pupils to use in their study.
- (f) Develop a set of instruments for assessing each pupil's progress, toward attaining the objectives.
- (g) Decide what materials of instruction and equipment will be necessary for the unit.

It is also essential that evaluation of pupils' progress must take place throughout the unit. It is necessary to incorporate evaluating procedures into the unit of work. Reports, papers, classwork, and progress tests are among the types of activities that make up this continual evaluation. In addition, probably each unit should develop a diagnostic test. All this



will help us to learn how well we have achieved our unit-wise objectives, and what have been the stumbling blocks.

### 3.1.13 : Test Yourself

1. Which of the following are general objectives and which are specific ?

- (a) You will be able to speak English well enough to carry on a simple conversation.
- (b) The pupil will develop vocational skills.
- (c) The pupil will appreciate the role of economics in our national life.
- (d) The pupil will be able to define force.
- (e) The pupil will be able to convert yards to meters.
- (f) The pupil will speak correct idiomatic English.
- (g) Given an appropriate sample of verse, the pupil will be able to identify the alliteration in it.

2. What is the value of a taxonomy of Educational objectives ?

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3. Rank the following in correct order from lowest to highest.

- (a) (i) Analysis
- (ii) Application
- (iii) Comprehension
- (iv) Evaluation
- (v) Knowledge
- (vi) Synthesis
- (b) (i) Responding
- (ii) Characterization by a value or value complex
- (iii) Receiving (attending)
- (iv) Valuing
- (v) Organization
- (c) (i) Manipulation
- (ii) Articulation
- (iii) Imitation
- (iv) Precision
- (v) Naturalization

#### 4. What is the use of Area-wise, Subject-wise and unit wise objectives ?

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### 3.1.14 : Correct Answers

Qn. 1 Ref. 3.1.2 Qn. 2 Ref. 3.1.8

Qn. 3 Ref. 3.1.3, 3.1.4, 3.1.5 and 3.1.6

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## MODULE 3.2

### CONTENT ANALYSIS

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#### 3.2.1 : Need

The problems of choosing content with reference to objectives, and of structuring the subject and its sequential development are the most vital issues in the curriculum process. The main task in curriculum development is to determine what to teach from the vast and growing fund of knowledge in each subject area, and then organize that content into logical sequences to serve all learners. It has been found that poor learning and poor teaching are often the result of poor organization of teaching in many classrooms, the teaching learning process is not based on the objectives and the selection of the content is not properly organized for instructional purposes with the result it leads to disorganized educational effort. So it is of vital importance, for an educator to give attention to content analysis with reference to objectives, structure and the nature of the subject and the sequential development.

According to David Tawney, "The object of content analysis is to measure the content by classifying it in terms of defined criteria which could relate to many qualities—subject-matter, pedagogy suggested, underlying value system and so on. In theory any variable could be included which can be sufficiently well defined to meet the level of



reliability which is thought acceptable. The profiles of curriculum materials thus obtained can be used in many ways. Perhaps the most obvious is to compare intention with reality : materials which purport to encourage creativity may have too many closed activities and not enough open-ended ones. The extent of coverage with what might be reasonable to expect, or the final versions compared with trial versions to reveal the effect of rewriting material".<sup>1</sup>

### 3.2.2 : Content Analysis with reference to Objectives

In the modern concept of educational evaluation, objectives are in forefront not only while learning activities are organized but also while testing is done. As already discussed under their role in the previous module, the objectives are the focal point in the educational process. This is the reason why teachers are expected to keep educational objectives always in sight while planning the teaching-learning process and carrying it out either in the classroom or outside. The objectives should be based or formulated on the analysis of the needs of society, on the study of the psychology of adolescents, and on the contributions of philosophy of education. Objectives should cover the whole society rather than some segments of it. They should be stated in functional terms. Vague generalities and platitudes are valueless. All activities should be selected on the basis of educational objectives, and then subjected to practical considerations of implementation. Activities selected must be appropriate and within the capabilities of the school, that is, the equipment available, and the abilities of the teachers and the pupils. So it is of vital importance to decide upon the educational objectives first and then frame the content, i.e., curriculum or syllabus or course.

Below are given some illustrations wherein it has been shown how the teacher starts with the objectives and selects the relevant content for the same. Let us select a unit (A) "India as a nation" in the citizenship education for class X at the secondary stage. Also Unit (B) on "Social and Economic Challenges Before our Country" for the same class and the same stage.

#### Unit A. India as a Nation

(Periods 4)

*Objective : The student understand that :*

*Content*

- |  |  |
|--|--|
| 1. Every region, religion and community in India has | (i) India —a land of diversities and composite culture—— |
|--|--|

1. David Tawney (Ed.) "Curriculum Evaluation today : Trends and Implications", London : Macmillan Education Ltd., 1976 p. 42.

contributed to its rich and varied culture.

2. India's freedom and prosperity lies in our sense of respect for different and diverse ways of life, worship and thinking—that are there in our country.
3. India's Unity lies in our love of the nation, mutual appreciation and correct understanding of our faiths, communal harmony and religious tolerance.

- (a) Language and literature
- (b) Festivals
- (c) Customs and traditions
- (d) Food and dress
- (e) Art and Architecture
- (f) Music and dance.

— Different regions, various religions and communities as part of Indian society and their contributions to the national life.

- (ii) National Integration——the need for it and factors promoting it.

#### *Suggested Activity*

Study of the lives of great men belonging to different regions, communities and religions and their contributions to cultural unity and national integration

### Unit B. "Social and Economic Challenges before our Country"

(Periods 18)

*Objective : The student understands that*

#### *Content*

1. Indian Society is mostly rural and depends on agriculture. There are special problems of the scheduled castes, tribes and other backward people which have to be solved on the basis of social justice.
2. Social change implies change in the attitudes, thinking, habits and methods of work, values and ways of life of the people.
3. Solution of our social and economic problems is to be

- (i) What India stands for? Democracy, Secularism, Socialism and National Integration.
- (ii) Some characteristics of Indian Society to-day.
  - (a) Rural and Urban population implications and problems.
  - (b) Problems relating to scheduled castes and tribes and other backward people.
  - (c) Position of Women in India.
- (iii) Some Social and economic problems.



- based on democratic, secular and socialistic ideals.
4. Planning will help us to have social and economic development and lead to the achievement of these ideals.
  5. Both the government and the voluntary agencies play an important part in bringing about social change and economic development.
  6. People's involvement in Social Change.
    - (a) Illiteracy and ignorance.
    - (b) Blind faith and narrow religious outlook
    - (c) Casteism.
    - (d) Parochialism
    - (e) Social customs and traditions like purdah and early marriages.
    - (f) Anti-social practices like dowry, corruption in public life.
    - (g) Health in-equalities.
    - (h) Poverty and unemployment
    - (iv) Measures and methods of Social Change.
      - (a) Directive Principles of State Policy ; their implications.
      - (b) Social legislation and other measures.
        - (i) Legislation against untouchability, child marriage, dowry system, immoral traffic in women and forced labour ; prohibition laws.
        - (ii) Social services for all. Health, educational, cultural and recreational activities.
        - (iii) Special Welfare programmes for weaker sections of society.
        - (iv) Cooperation.

### *Methods*

- (i) Democratic participation by the people.
- (ii) Due consideration given to local conditions and utilization of local resources.
- (iii) Economic Planning.
- (iv) Employment guarantee scheme
- (v) Eradication of Poverty.
- (vi) Use of mass media

- (vii) Secular voluntary organizations.
- (viii) State organizations i.e., Central Social Welfare Board, Community Development Centres, Labour Welfare Centres etc.
- (ix) Integrated rural Development.

#### *Suggested Activities*

A socio-economic study of village in the neighbourhood with a view to understand the above mentioned challenges.

### **3.2.3 : Organizing Curricular Content**

Poor learning and poor teaching are often the result of poor organization of the curricular content. Scattered content, unrelated learning, loss of motivation, emphasis on piece-meal work and drill characterize the work in such a disorganized educational venture. After curricular activities have been selected, they need to be organized in a systematic way for instructional purposes to prevent a disorganized educational venture. Organizing curricular content requires the ability to classify knowledge, to utilise or to improvise a structure of knowledge, to organize activities around big points such as principles, concepts, and understandings. This work requires further an understanding of the learner, a knowledge of his state of readiness, and a knowledge of his interests so that these can be woven into the organization in a proper way.

### **3.2.4 : Subject**

The most common, the most traditional method of organizing learning activities is to group them by subjects, as science, mathematics, history, language, and the like. This method is a logical one. Subjects are subdivided as fast as knowledge advances. Each subdivision includes closely related knowledge, for example, bacteriology which is a study of microscopic organisms. Subjects are too broad to be constituted as courses of study. It is of vital importance that materials must be selected from them for instructional purposes on the basis of their contribution to the objectives of education.

### **3.2.5 : Topics**

The most common organization within subjects is that of topics. Topics are major subdivisions, consisting of all activities closely related either by type, application, function, location, or natural occurrence. An



illustration of this scheme from biology would be a major subdivision "physiology" and a topic or chapter "teeth". This organization permits further subdivision into structure and care of teeth. A topical arrangement is, therefore, often the basis of units of instruction for it combines of learning activities which are related to life situations.

### 3.2.6 : Chronological

Many a content can be organized chronologically, as the historical material. If a topical organization is employed and a chronological arrangement within the topic is followed, instruction is facilitated. The discovery of relationships leads to learning and motivation. Though there is no relationship between or among dates, yet their significance lies in the behaviour of men on certain dates.

### 3.2.7 : Logical

If the structure of knowledge is considered, many subjects must be presented in a logical manner to take into account the dependence of each principle or concept on both previous and subsequent principles. Geometry is an example of a subject in which there is a dependence of concepts. The proof of many theorems is based upon other theorems which have previously been proved. Although there are many relationships which can be learned intuitively, formal proof depends upon an orderly sequence of relationships presented in a logical order. This type of organization brings into operation such concepts and as pre-requisites and sequence. In each subject there are some concepts and relationships which may be presented independently of others. However, many outcomes are complex and cannot be understood unless certain facts, generalisations, and principles which are inter related have been learnt. In such cases a logical organization is about the best for instruction.

### 3.2.8 : Psychological

If the instructional sequence and order of presentation are psychologically arranged, on the lines indicated below, learning is facilitated and motivation is secured through the subject matter rather than through external incentives.

- (a) Start at the present before going into the past, or start at home before going to far places.
- (b) Start with the known and familiar before introducing the unknown and unfamiliar.
- (c) Begin with easy materials and progress to the more difficult.
- (d) Present concrete materials before presenting abstract ones. Concepts should be presented in the vocabulary of the students.

After the concept is understood it may be presented in terms of symbols.

- (e) Present specific instances and urge people to make generalisations (inductive method) rather than present generalisation and ask pupils to make applications (deductive method).
- (f) Present applications of materials at the same time as the learning materials are presented.

These principles are more applicable to the arrangement of activities within topics than among them, but they may be applied in both the situations. Topical sequences should follow the interests of pupil as they relate to seasonal changes and school activities. They should also be varied, and if appropriate and possible, they should coincide with current happenings. Psychological organizations are applicable also to problems pertaining to the fulfilment of educational and personal needs and pupil's interests.

### 3.2.9 : Needs and Interests

The curricular activities should be based on the needs and interests of the adolescents. In the past there was considerable imposition of learning materials on pupils under the guise that adults were in a better position to determine what was needed than the pupils. To make curricular activities more effective, it has to be based on needs and interests of the pupils. Needs may be basic to life such as food, air, water, shelter (biological), companionship (social), or they may be academic such as deficiencies in fundamental skills and concepts which retard continued learning in some subjects. Pupils have need for activities to relieve monotony (recreational), for worship (religious), for love and recognition (psychological). Interest may be manifested in people, things, or ideas and may be relatively permanent or transitory. There should also be scope for the societal needs and individual interests.

The youth needs have to be identified and then utilised as curriculum determinants. The needs at one developmental level would demand a certain curriculum content and type of organization. Needs at another level would require different materials and structure for learning.

### 3.2.10 : Correlation and Fusion

Learning activities may be related to one another. It helps in the following ways :

- (a) The transfer of training is facilitated. Pupils cannot transfer classroom—acquired knowledge to their everyday lives without help, and if this transfer does not take place, there is little



possibility that materials learned in school will function in their lives outside school.

- (b) Pupils are more likely to be motivated if they can see the relationships between subjects.
- (c) Students obtain greater depth of knowledge, and their studies are immensely enriched through correlation of subject matter.
- (d) Most units, topics, and activities cannot be fully understood if they are studied from one point of view only.

Several subjects in the secondary curriculum which are closely related may be combined to form one course of study. This uniting is called fusion.

### 3.2.11 : Integration

The term 'integration' refers to a process that is taking place within students and to an 'integrated curriculum', an organization of learning activities designed to aid in this process. The curriculum should assist students in becoming functional personalities and integrated personalities. Fusion and correlation help promote this process much more than the traditional water-tight subject organization.

### 3.2.12 : The Process

Integrating and relating educational experiences by organizing them into instructional units helps promote the process of maturing and of becoming integrated personalities. Since integration is a process of unifying insights and out-looks, the greatest service the school can render to youth is by integrating and unifying the curriculum so that it assists him with his integration problems by helping him see associations and relationships, make applications, and transfer learning to new situations.

### 3.2.13 : Instructional Units

The usual method of organizing the material when all subjects are unified is through the instructional unit. The unit is an outgrowth of several older methods of organizing learning activities such as the project, the contract, and organization about problems. H.C. Morrison, who developed the concept of units and stimulated interest in them, defines unit as a "Comprehensive and significant aspect of the environment which, when learned, results in an adaptation in personality".<sup>2</sup> According to this definition the unit may be part of one subject called a subject unit, or it may consist of learning activities from several subjects. Another

2. H.C. Morrison, "The Practice of Teaching in the Secondary Schools", Chicago; University of Chicago Press, 1961, p. 24.

type is called the centre-of-interest unit, defined as a "series of related activities or experiences organized about a central theme, designed to realize some dominant purpose, without respect for subject-matter lines."<sup>3</sup> Both types of units are useful. The subject unit should be employed in those areas in which it is not necessary to include other subjects for the solution of problems or for securing an understanding. The center-of-interest unit is especially useful when the function of integration is served.

The subject organization of carefully prepared units enhances learning. Learning is seeing relationships, and one of the best ways to aid pupils in seeing them is to present a variety of related materials concurrently or in close sequence. The unit is supported by organismic or gestalt principles of learning which are also known as field theories. It also facilitates the problem-solving approach. The unit method of organizing materials brings together all the learning material needed for the consideration of the problems, or if problems are used as bases for selecting units, all the materials needed will be included in the units. If the problem approach of teaching is combined with unit organization, there is even greater opportunity for fostering creativity, self-expression, exploration, and a receptive attitude towards the environment. The unit organization combined with the problem-solving process facilitates the achievement of these outcomes.

### 3.2.14 : The Structure of a Unit

Although there are a number of approaches in the selection of units and themes about which they are sequentially organized, the structure of units is similar whether they are subject or experience oriented like projects. The features common to all which act as guides in their construction are :

(a) *A central theme.* The central theme of a unit is the purpose for which it is constructed ; it tells the objectives and outcomes and suggests the learning experiences. The theme or purpose is often an outgrowth of a previous unit and leads to the following one.

(b) *Objectives.* In each unit there are several types of objectives ; the primary and secondary objectives of the teacher, the group objectives for the class, and the individual objectives as specific needs arise. Each unit contributes to the general objectives which are partially attained through the specific ones of the unit. Although teachers have objectives for pupils, these should be developed by them as the unit progresses. Secondary objectives are often thought of as concomitant outcomes for they are the inevitable accompaniment of primary outcomes.

3. Ibid, p. 26.



(c) *Methods.* Several methods that have been devised for the units have some common features. The first is the orientation or introduction period in which the stage is set and motivation is secured. In this step, the unit to be studied is related to the previous ones and those to follow. Students are giving an over view of the entire unit, some objectives are stated, and standards of achievement are determined. The second stage consists of assigning activities in which pupils' co-operation is secured, these include all group and individual assignments. This is followed by a work study period which may cover several days. Classrooms become informal laboratories. This stage is also called the developmental activity period in which such learning activities as reading, observing, analysing, problem solving, discussing and, composing go on. The learning experiences are brought together in some form of culminating activity. This is the organizing stage. It is a synthesis period in which the students summarize their experiences. They arrive at generalizations and conclusions as well as make presentations and give reports. The final stage is that of evaluation. The relative merits of procedures, materials employed, and activities experienced are evaluated, and an appraisal of the extent to which goals were achieved is made.

(d) *Content.* The content is made up of the activities that have been fully discussed above, and the material used in these activities.

### 3.2.15 : Core Programmes

The core programme consists of the major learning activities which are a part of general education and are unified about centres of interest and problems. Schools which have a portion of the curriculum organized into units centred about the common needs, interests, and problems of youth have what is commonly called 'core programmes'. The characteristics of core programmes as given by Lurry and Alberty are :

(1) *Teacher pupil planning is included, as well as the teacher-teacher planning.* Through teacher guidance, the pupils learn to plan solutions to problems, to put their plans into action and to assume the consequences of their actions.

(2) The problem-solving approach is paramount. Core programmes deal with problems of special interest to pupils and which are common to the needs of the group.

(3) In exploring common problems and in meeting common needs and widening interests, subject matter from all pertinent fields is utilised.

(4) The core is required of all pupils regardless of special needs, problems and interests. The core constitutes only a part of the entire

curriculum. Special interest courses are offered to meet needs beyond the core programme.

(5) Individual and guidance programmes are integral parts of core programmes.

(6) Evaluation is a continuous and cooperative process. Pupils and teachers work together in the evaluation as they co-operate in the planning and executing of units.

(7) Fundamental skills are taught as use is made of them in problem solving.

(8) A wide variety of resources and instructional materials and techniques are employed to promote learning. The resources include those in the school and in the community.

(9) The democratic value system is the basis of the core programme. It employs co-operation ; emphasizes concerns for the optimal development of each individual ; employs a problem solving process, and emphasises the understanding of ourself and others. It also teaches pupils to develop independence in thinking and control of conduct".<sup>4</sup>

### 3.2.16 : Unifying Centers

There are a number of unifying schemes employed as aids in selecting and constructing units. Some of these are basic needs of society ; the life and times of ethnic or cultural groups, both present and past ; ecology of certain geographic areas ; social and economic institutions ; the adolescents' environment ; and local, state and national governments, etc. Instructional Units can be constructed about these areas and given a problem approach. The organization can also include work related to common needs and the pursuit of interest. Some examples are :

- (a) Problems of self understanding.
- (b) Problems of Social living.
- (c) Social problems.
- (d) Social institutions.
- (e) Economic institutions.
- (f) Democratic Government.
- (g) Government Services.

In a Secondary School the core curriculum with learning activities organized around problems selected on the bases of the common needs and interests of adolescents and the objectives and purposes of secondary education, will form the basis for this programme. These fundamentals are taught in the core programme. Special remedial classes should be

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4. Lucile L. Lurry and Elsie J. Alberty, "Developing a High School Programme", New York, Macmillan, 1957, pp. 29-43.



formed for slow learners and handicapped children, so that all students acquire learning experiences adequately.

### 3.2.17 : Test Yourself

1. Explain briefly with reference to objectives why content Analysis is essential ?
- .....
- .....

2. Make Content Analysis of any three topics for class X in a subject of your interest.
3. How can you organize the curricular content properly ?
4. Draw a core programme for the Unit 'Health and Hygiene' for teaching class X.

### 3.2.18 : Correct Answers

Qn. 1. Ref. 3.2.2

Qn. 2. Ref. 3.2.2

Qn. 3. Ref. 3.2.3

Qn. 4. Ref. 3.2.15

### 3.2.19 : Suggestions for further reading

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  - (i) Content of Self Learning Materials (CAPE), NCERT (1979).
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## MODULE 3.3

### ✓ LEARNING EXPERIENCES

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#### 3.3.1 : Need

Selection of appropriate learning experiences is essential for achieving the educational objectives. A prevailing definition of curriculum is that it consists of all the learning experiences a student can have at school. This includes all of the courses of study, all the student activities, and the different learning experiences connected with the entire school environment. It is clear that, for a classroom teacher, the organization of learning activities is the only functional aspect of the concept of education, available. The teacher's job is to provide learning activities suitable for specifications of the objectives on the one hand and the teaching points on the other. The provision of these learning activities helps teacher-pupil interaction, pupil-pupil interaction, and the interactions within oneself. This interaction of learning activities results into experiences, which ultimately results in learning.

#### 3.3.2 : Nature of Learning

Learning is both, an outcome and a process. Each teacher in each course of study must determine just what he expects his pupils to achieve. Expected achievement is expected learning, and is expressed in terms of goals, objectives or outcomes. Attaining them is the process of learning.

There has always been a general agreement among various authorities on the subject that learning refers to a more or less permanent change in behaviour which occurs as a result of practice. The term behaviour, as is used here, demands special attention. It refers to mental, emotional and physical reactions or responses. So mental, emotional and physical reactions or responses are behaviours. The permanent change in behaviour is learning. Thus, acquiring of knowledge, broadening of understanding, improvement in physical skills, development of attitudes, deepening of appreciation, etc., are all classified as changes in behaviour.

Learning is an inferred process, for one can never observe it directly. Suppose a teacher teaches a lesson. After the teaching is over, he says that he has taught the lesson. Can a student claim that he has learnt it? There is no evidence that he has. How, then, is the teacher to know that the student has learnt the lesson? He has to put the student to test. It is only from the student's performance that the teacher assesses the change in behaviour that has taken place after he has taught the lesson. This change in performance (i.e. reaction or response) indicates the occurrence of learning.

### 3.3.3 : Learning Activities

The term learning activities may be explained as activities which include arrangement of teaching aids, questioning, explanations, observations, visits, handling of apparatus, models, charts and specimen, reading, writing, drawing, etc., and which ultimately lead the students to learning. Providing learning activities in the class or even outside it is known as teaching. Listening to teachers, listening to other students, speaking, thinking, observing, recalling, drawing figures, locating places on a map, etc. are also learning activities. The classroom-teacher provides these activities to his students.

### 3.3.4 : Learning Experiences

Children learn by feeling, thinking and acting. Learning results from the active participation of children in the stimulus situation which the teacher provides in the class. Learning experience is not a part of the syllabus, nor is it a unit nor a teaching point. It is not a traditional lesson plan nor a simple activity. It is the interaction of the learner and the situation provided by the teacher. Each of these learning experiences modifies the behaviour of the pupil.

When a student takes part in learning activities, he develops certain understanding; he realises, feels, and appreciates something. For example, a student is asked to locate Ambala, on the map and he does so. This is a learning activity. Now he understands or realises that :



- (a) Ambala is in the northern part of India.
- (b) It is situated in Haryana State.
- (c) It is a railway junction etc.

In the above example, as a result of learning activity, the student gets some 'after effects' in the form of understandings or realisation or feeling or appreciation. These after-effects are called learning experiences.

Take one more example. A teacher discusses the place value of different digits in 568. The students take part in the discussion. This is a learning activity. During the discussion the student :

- (a) Understands that if 6 is less than 8, the value of 6 in the number 568 is more than that of 8.
- (b) Understands that in the number 568, the value of 5 is more than that of 6 and 8.
- (c) Understands that the value of a digit in a number depends upon its place in the numbers.
- (d) Appreciates the place value system in mathematics.

Here the after-effects in the form of understanding or appreciation are the learning experiences. Consider the following example. A teacher reads a poem and the students listen to it. This is a learning activity. At the end of it, a student :

- (a) feels that the poem is excellent ;
- (b) realises that the poet has used a suitable metre to create the tragic atmosphere ;
- (c) realises that the poem seems to be one of the best pieces of literature ;
- (c) gets tears in his eyes.

Here the after-effects in the form of feeling or realisation are the learning experiences. It will be seen from the above examples that learning experiences depend upon how well you can organize the learning activities. The more adequate and methodical the learning activities are, the richer will be learning experience.

We have already seen that learning experiences result from the interactions of learning activities. In order to produce different types of learning experiences, the teacher may provide various activities; if he provides different learning activities, different types of learning experiences will result. Again, in order to produce a particular type of learning experience, a variety of learning activities may have to be provided. For example, to develop the understanding that the origin of the river Ganga is in the Himalayas, the following activities may be provided.

- (i) The students may be asked to locate the Himalayas and the river Ganga on the map of India.
- (ii) The students may be asked to observe and find out where the Ganga meets the bay of Bengal.
- (iii) The students may be asked to read, in their textbook or in a reference book, the description of Gangotri from where the Ganga streams out.
- (iv) The students may be taken to Gangotri.

### 3.3.5 : Selection of Learning Experiences on basis of Learning Principles

It has been found that learning experiences based on learning principles are more useful in the teaching-learning process. During the last forty years there has been marked education emphasis on the learning principles. Probably the most useful approach is to consider educational process as "teaching learning process" or "teaching-learning transaction" within a particular kind of organizational framework. According to Howard L. Kingsley and Ralph Garry, "Some principles of learning which pertain to Curriculum Planning and result in greater efficiency in directing learning are :

1. Relationships can be more readily seen if related or seemingly unrelated learning activities are presented at the same time or in close sequence. Organizing them into units brings them together. The problem raising method employs related materials.
2. Intrinsic motivation is superior to extrinsic. Motivation found in learning activities and in the method of presenting, results in more continued efforts than motivation secured through rewards and punishments designed by teachers.
3. The method of critical thinking can be employed with groups if the problems selected are of common interest.
4. All outcomes of learning—cognitive, affective, psychomotor—are achieved more efficiently if developed together, rather than when separated for instruction.
5. Transfer proceeds most rapidly when learning activities are applied, relationships taught, and pupils are aided in making generalisations.<sup>1</sup>

### 3.3.6 : Appropriate Learning Experiences

It has been found that selecting appropriate learning experiences suitable for educational goals must be purposeful, continuous, interactive

1. Howard L. Kingsley and Ralph, Garry. "The Nature and Conditions of Learning", Englewood cliffs, Prentice Hall, 1957 pp. 106.



and integrating. The learning experiences should have integrative implications. It has been suggested that learning experiences should be appropriate for the total curriculum rather than a single course. They should be related to the needs and problems of life experiences of the learner. They should involve feelings, beliefs and values as well as the intellect. It is also required that the specific facts be related to broad principles and generalisations. So keeping in view the psychological needs of the students, the sequence and order of the learning activities are so maintained, in general, that students may be left with richer aftereffects (that is, learning experiences). Such a planned and well organized sequence of learning activities is a good method of teaching.

The selection of learning experience on facts, concepts, principles, generalisation, curricular and co-curricular activities etc. is essential for making learning experiences more functional and effective in the teaching learning process.

### 3.3.7 : Classification of Learning Experiences

Learning experiences can be classified into two categories :

(a) Direct experiences and (b) Indirect experiences.

*Direct Experiences* : First hand experiences with various objects or symbols are termed direct experiences. These experiences are more than perceptual learning in the sense that they include experiences with symbols. Perceptual learning arises out of experiences dependent upon seeing, hearing, smelling, tasting, touching, feeling, handling and manipulating objects in various ways, and we get the meanings of terms like, sweet-sour, soft-hard, green coloured, pulling-pushing, etc.; through perceptual learning. We use symbolic words to describe them some of the illustrations of direct experiences are given below :

- (i) Drawing figures, painting models;
- (ii) Setting up apparatus for experiment;
- (iii) Listing important facts, points;
- (iv) Presenting ideas orally or in writing;
- (v) Observing samples or specimens;
- (vi) Experimenting with physical and chemical materials;
- (vii) Constructing models, charts, plans and diagrams;
- (viii) Dramatising historical events;
- (ix) Summarising a lengthy description;
- (x) Collecting, analysing and interpreting the data and generalising them.

### *Indirect Experiences*

Those experiences which are not first hand experiences are termed indirect experiences. It is very difficult to have direct experiences in all classroom situations. Every student cannot get a direct experience in matters such as tremors of an earthquake, feelings while travelling by air or by sea. A student can appreciate them through imagination only. Indirect learning experiences also have a place in the process of learning since it is impossible to have first hand experience of all things. A person has recently visited Kashmir. He beautifully describes the beauty of nature in Kashmir. The listeners enjoy it. On the part of the listeners, this experience is not a first hand experience; it is an indirect experience. A student reads the description of Konark. He is thrilled. Similarly we enjoy a running commentary of a cricket test match and get a thrilling experience. These are indirect experiences. Here are some more examples of indirect experience.

- (i) Reading accounts or descriptions or discussions in books, magazines, journals, newspapers;
- (ii) Observing pictures, photographs, maps, charts, models;
- (iii) Listening to oral descriptions, lectures, talks.

It may be pointed out that it is rather difficult to keep the activities resulting in direct and indirect experiences completely separate; it may not be desirable to do so. In many activities there may be combinations of direct and indirect experiences.

### **3.3.8 : Planning and Organization of Learning Experiences with references to Instructional Objectives.**

The planning and organization of learning experiences with special reference to instructional objectives is essential in the curriculum process. When teachers prepare courses of study and make long term lessons plans, they must constantly keep in mind that the learning experiences are based on the principles of validity, comprehensiveness, continuity, multiple learnings, relevance and pupil participation. The learning experiences should be interesting so that they may arouse curiosity and interest in pupils and this can be judged by observing the behaviour of pupils. Appropriateness of media, keeping in view the suitability to age level, grade level, maturity level and to the unit taught, should be considered; it can be verbal or non-verbal or both. Individual students must be kept in view and their needs considered while planning learning experiences. The following procedures help in formulating learning experiences relevant to our instructional objectives.



correlating different subjects and breaking down their water-tight compartment. It helps in applying and organising the subject matter into meaningful learning activities and experiences, and in planning and organising the learning experiences with special reference to instructional objectives.

### 3.3.13 : Characteristics of a good Learning Experiences

It is the responsibility of the classroom teacher to provide to his students learning situations composed of a variety of learning activities, so that they may have direct as well as indirect learning experiences which ultimately result in proper learning. The characteristics of a good learning experience are given below :

- (a) The learning experience should be directly related to the instructional objectives, since our aim is to achieve the instructional objective through learning experiences.
- (b) It should satisfy the psychological needs of the learner. For example, for adolescents, comic stories may be made available, and for school children the fairy tales.
- (c) It should be meaningful. For example, asking students to take down the theorem written on the blackboard without understanding it, will not result in a meaningful experience.
- (d) It should be appropriate to the maturity level of the learner. For example, primary school children should be asked to write essays on topics like, My friend, My School, The Postman etc., while the secondary school students should be asked to write essays on topics like, If I were a Headmaster; Patriotism; An evening at the sea shore; An Ideal Student etc.
- (e) It should be related to life situations, so that they may be more effective, more meaningful, and satisfying to the learner. For example, it will be better to ask small children to add five pencils to seven pencils rather than ask them to add five and seven.
- (f) It should be reinforced. For example, the experience of the function of a motor may be reinforced by the experience of the function of a dynamo. Both types of reinforcements, positive and negative, may be made use of in enriching the learning experience.
- (g) It should be intensive. How to produce an intensive experience is an art. Again, how to change (increase or decrease) the intensity of an experience is also an art. The use of audiovisual aids in this connection would be very helpful.

- (h) It should be varied, rich in content and novel. Multisensory experiences will be helpful in sustaining interest in an activity. A novel experience will also ensure that students are not bored. A student who studies the digestive system of various animals will get a richer experience than the one who studies the digestive system of only one animal. The novelty, richness and variety of experience, sustain the motivation of the students.
- (i) It should be related to the availability of material and time. This is the practical aspect of selecting learning experiences.

### 3.3.14 : Sources of Learning Experiences

Every human being lives amongst thousands of stimuli around him. Every moment, except when he is sleeping, he has to attend to one or another stimulus. In other words, in the conscious state, a person is always reacting to stimuli. He has a lot of chances to change his reactions (i.e., behaviour) in the desirable direction, that is, to learn. He has every chance of having learning experiences. There are many sources of learning experiences, which we may group under some common heads.

- (a) *Home* : The home provides a number of learning experiences, e.g., sitting, standing, walking, talking, oral expression, dress, diet, socio-economic status deviations, child-rearing practices, etc. The home is mostly an informal agency.
- (b) *Society* : Many desirable and undesirable experiences are provided by society. Many vices and virtues can be acquired through all these experiences.
- (c) *Peer-groups* : Learning experiences gathered from peer-groups help in developing such qualities as leadership, co-operation etc.
- (d) *School* : A school is a miniature society. This is a formal agency providing a variety of learning experiences. Excursions and visits provide learning experiences which may help students to develop certain good qualities like co-operation, and helpfulness. Experiments in the laboratory provide learning experiences related to laboratory skill. School exhibitions provide students learning experiences which may help them develop the way of feeling, skill of presentation etc. Audio-visual aids widen the scope of knowledge and understandings. Co-curricular activities like debating, elocution, dramatisation, help students to achieve skill in expression, systematising arguments, reasoning etc. Sports and games provide learning experiences which may help students to develop qualities of leadership and attitude of co-operation, sportsmanship etc. The methods of teaching like group discussion



method, seminars, etc., provides various types of learning experiences to widen the horizon of the student's knowledge and understanding. The school library enrich students knowledge and understanding.

- (e) *Mass-Media* : Radio, T.V. newspapers, libraries, etc. enrich knowledge and understanding.

In short home, society, peer-groups, school and mass-media provide various sources of learning experiences for planning and organizing them with special reference to instructional objectives.

### 3.3.15 : Test Yourself

- Q. No. 1 Explain the terms 'Learning activities' and 'Learning experiences' Give three suitable examples.
- Q. No. 2 What are the characteristics of a good learning experience?
- Q. No. 3 For each of the following learning activities, suggest what learning experiences may be had by students :
- Ram is asked to show the rivers of Northern India on the map.
  - Krishna is asked to read a poem loudly.
  - Mohan is asked to prepare and collect Oxygen.
  - Sohan is asked to locate Delhi on the map of India.
  - Sharad is asked to point out the stomach in the chart showing the organs of the digestive system.
  - Kundan is asked to draw a circle of 3 cm. radius.
  - Sharma is asked to solve a problem based on congruent triangles.
- Q. No. 4 Discuss the two types of learning experiences, direct and Indirect. Give five suitable examples for each.

### 3.3.16 : Correct Answers

- Q. No. 1. Ref. 3.3.3 & 3.3.4
- Q. No. 2. Ref. 3.3.5, 3.3.5 and 3.3.6
- Q. No. 3. Ref. 3.3.7
- Q. No. 4. Ref. 3.3.7

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## MODULE 3.4

### INSTRUCTIONAL STRATEGIES

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#### 3.4.1 : Need

The development of appropriate instructional strategies relevant to the objectives is the very heart of the curriculum process. There is a close relationship between educational objectives, curriculum content, learning experiences, instructional strategy and evaluation ; they are the vital components of the curriculum process. The failure or success of an educational system depends largely upon the appropriate instructional strategies evolved for its effective implementation. The nature of educational objectives change with the needs of the society, which are never static. Hence, instructional strategies have to undergo a dynamic change with the change in educational objectives, structure of content, and learning experiences.

In the simplest form, curriculum process may be represented as in figure 1.

For implementing need-based curriculum relevant to educational objectives, there is an urgent need for developing divergent and appropriate instructional strategies. This will rectify the major defects of our educational system, like teacher-dominated instruction, rote learning by pupils and information based examination etc.

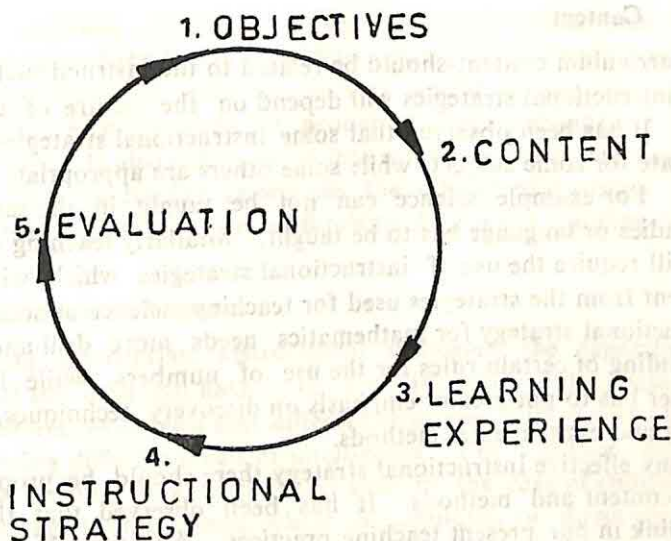


Fig. 1. Simple Curriculum Process.

### 3.4.2 : Class-Room Based Instructional Strategies

#### 3.4.2 (a) : Instructional objectives

The instructional objectives should be well-stated. The term well-stated involves communicating clearly without any ambiguity what you want the pupils to achieve. They should be adequate with respect to content and learning experiences. They will vary with the three domains, viz.; cognitive, affective and psychomotor. This implies that instructional strategies cannot be same in respect of all the aspects of development. For instance to develop certain skills in the pupils, imitation, drill, practice etc. will be more appropriate. For the development of attitudes, the techniques of behaviour modification will have to be made use of. To impart knowledge to the pupils, the techniques of direct exposition and self-learning devices of teaching and learning may prove more useful. To develop understanding among pupils, discovery techniques of learning, inquiry methods of teaching and application of acquired knowledge may, perhaps, be found more appropriate. To develop certain behaviour and habits in pupils the process of conditioning may have to be made use of.

Thus instructional objectives are of practical use to a classroom teacher. Unless the teacher specifies instructional objectives for a particular lesson, he can neither plan his instruction for the lesson effectively nor test its effects. Hence, instructional objectives are the most fundamental determinants of the class-room based instructional strategy.



### 3.4.2 (b) : Content

The Curriculum content should be related to the instructional objectives and the instructional strategies will depend on the nature of curriculum content. It has been observed that some instructional strategies are more appropriate for some subjects while some others are appropriate for other subjects. For example, science can not be taught in the same way as social studies or language has to be taught. Similarly teaching of mathematics will require the use of instructional strategies which will have to be different from the strategies used for teaching science or social studies. An instructional strategy for mathematics needs more drill and a logical understanding of certain rules for the use of numbers, while for science the teacher has to put greater emphasis on discovery techniques, inductive reasoning and experimental methods.

For any effective instructional strategy there should be proper linkage between content and methods. It has been observed that this is the weakest link in our present teaching practices. Advances in educational technology demand a change in methods. Methods are meaningful only when they are taught in relation to the content and classroom situation. There is a need of integrating different subjects by way of developing inter disciplinary units in order to save time and to make teaching more meaningful. There is an urgent need of bridging the gulf between theory and practice and make it more relevant to our classroom situations. The content should be related to the life, needs and aspirations of our students.

### 3.4.2 (c) : Learning activities

For appropriate classroom learning activities we have to select learning experiences from the Socio-economic strata of the classroom children. It has been observed that boys coming from poor strata need some orientation in adjusting themselves to the upper strata public schools. Learning activities have to be in accord with the life of the students and the climate of the school and the learning experiences should be relevant to classroom situation. It should be directly related to instructional objectives since our aim is to achieve instructional objectives through learning experiences. Learning activities should be related to life situations so that they may be more effective, more meaningful, and the learner may be more satisfied. They should be varied, rich in content and novel. Multi-sensory experiences will be helpful in sustaining interest in an activity. It ensures that students are not bored. They should be appropriate to the maturity level of the learner. They should be meaningful. For example, asking students to take down the rule written on the blackboard without understanding, it will not result in a

meaningful experience. It should satisfy the psychological needs of the learner. The role of teacher in providing appropriate learning activities relevant to the classroom situation is very useful in any instructional strategy. It acts as a stimulant for proper student participation in the learning activity. It also enhances his interest in learning and caters to his needs. Thus, the teacher determines the quality of learning. Hence appropriate learning activity is most fundamental for the teaching-learning process.

#### **3.4.2 (d) : Individual differences**

In selecting appropriate instructional strategies, the capacities and capabilities of the child will have to be kept in mind. The rationale of individual differences implies that different strategies will have to be used for pupils having different levels of intelligence. For instance, discovery techniques of learning may work very well in the case of children who are above average in intelligence, whereas techniques of direct communication may prove more effective in the case of average and below average children. Similarly different strategies have to be evolved for the handicapped children. We cannot teach the gifted and slow learners with the same instructional strategies. Special consideration has to be given to the teaching of gifted, slow and disadvantaged pupils.

#### **3.4.2 (e) : Availability of Resources**

Availability of resources is one of the fundamental factors which will have to be taken into account while evolving any instructional strategy. We cannot implement any instructional strategy without adequate support materials. The success or failure of any instructional strategy largely depends upon the availability of resources needed for its implementation. For the proper classroom teaching, materials like a good black-board, audio-visual aids, good laboratories for the science students, good sports material for playing games, etc. are essential. It becomes difficult for our limited resources to provide new sophisticated instructional media to our schools like teaching machines, television and video tapes, recorders and projectors and other educational technology which are now used widely in the developed countries. So, in adopting any instructional strategy for our schools, we have to keep in view the availability of resources.

#### **3.4.2 (f) : Entry behaviour of the child**

For evolving any classroom instructional strategy the entry behaviour (present condition) of the child has to be kept in view, with reference to a particular objective. The pupil may be above average, average, or below



average. For achieving our instructional objectives we may have to use the individualised instruction techniques and mastery learning approaches. According to James B. Carroll, the pioneer of mastery learning, "Amount of time needed to learn is obviously a function of how much has been learned already. Here again there are important problems of measurement. If one can measure what the child already knows, he may be able to save the time of both teacher and child. Various programmes of instruction are now coming out with built-in-tests to determine where to place the student in the learning sequence. Of necessity, these tests try to get at the specifics of learning for example to find out what letters of the alphabet the child knows when he starts to read. Actually, for many of these learning situations, the best judge of amount of prior learning and readiness may be the teacher"<sup>1</sup>.

### 3.4.2 (g) : Organizational climate

The selection of appropriate instructional strategies will also depend on the type of organizational climate prevailing in the school and the classroom. Discovery techniques of learning, field explorations, discussions, organization of functions, celebration of events etc. may be selected if the school climate is permissive enough. On the other hand, formal methods like lecturing, drill, explanation, demonstration etc., will have to be preferred if the schools climate is formal in nature. The organizational climate plays an important role in determining the choice of the instructional strategy, because organizational climate involves the personality of teachers and the principals, and the sociological framework of the community. Organizational climate may be pictured as a personality sketch of a school, as personality describes an individual, so organizational climate defines the essence of an institution. So it is vital for any instructional strategy for its effective implementation to keep the organizational climate of the class and school in view.

### 3.4.2 (h) : Appropriate to the age, ability and interest of the child

It is now generally agreed that the instructional strategy should be appropriate to the age, ability and interest of the child. The behaviour of the child is based on a number of physiological and psychological needs which develop with age. Also there are his interests which govern a good deal of his behaviour. Similarly there is an accompanying intellectual growth with the stages of human development. There are motives which impel a child to act. Education becomes a much more interesting and meaningful activity for the child, if the teacher takes care of his

1. James H. Block, "Mastery Learning—theory & practice", New York, Holt Rinehart, 1971, p. 43.

needs, age, motives, ability and interests. Any instructional strategy which is not based on these fundamental factors is often devoid of any real meaning to the child. In any instructional strategy there should be sufficient scope for different kinds of activities in the class and the school, in order to satisfy the child's needs for activity and to break the monotony of sitting for long hours in the class room pouring on books alone. It is necessary for the child's psychological need for variety. Co-curricular activities involving group situations are especially important for the development of interests, and meeting some of the basic psychological needs of the child, so they are considered to be an integral part of the curriculum. The needs, motives and interests of the child are particularly important for being taken into account for the achievement for the developmental objectives of education. In co-curricular activities, the child uses his ability in socially useful ways. He uses his imagination and understands the physical and social phenomena and events in his environment. He makes a worthy use of his leisure. He enjoys doing work with his hands, and he cooperates, with others in work.

#### **3.4.2 (i) : Good learning environment**

A good environment for learning is an essential factor for an effective instructional strategy. A child under unhygienic conditions cannot be attentive to any learning activity. It goes without saying that both the teacher and the student are favourably affected by good environmental conditions. The class-rooms should be properly ventilated and properly lighted. Proper seating arrangement is also essential for the attention of the child to any learning activity. There is a need of good classroom equipment like blackboards, erasers and chalk sticks. Unfortunately, it has been found that even these basic necessities are not adequately met in our schools. A good school library is also essential for motivating the learners. Similarly for Science students the school laboratory plays an important role in developing the scientific attitude in children. The teacher should also stimulate the learning environment by adopting a democratic attitude and encouraging pupils to participate in all the learning activities. The personality of the teacher plays a vital role in developing the learning environment in the classroom.

#### **3.4.2 (j) : Research and Development**

There is an urgent need for research to solve classroom problems, and develop instructional techniques and methods to ensure maximum effectiveness. Studies concerning motivation, learning, development and behaviour characteristics of children will have to be encouraged.



Curriculum renewal is a continuous activity. Once a curriculum is developed and introduced it is necessary to study the process of implementation, the materials and methods used and outcomes. Studies concerning school climate and the role of different functionaries in the school to ensure effective learning conditions will have to be made at the State level by State agencies. It is necessary to carry out evaluative studies to ascertain how far the objectives of secondary education as a whole have been achieved. Studies on socio-psychological implications of the proposed curricular changes have to be conducted. There is an urgent need to understand and explore the classroom problems of the scheduled castes and schedule tribe students and suggest remedial measures for improvement. In short, research and development should be a continuous process for the development of any appropriate instructional strategy.

### 3.4.3 : Environment Based Instructional Strategies

The primary responsibility of the school is to prepare the pupils for life. The school must, therefore, see to it that they acquire the knowledge and attitude necessary for adjustment to environment. In the present times the world is changing fast. School must, therefore, lay foundations of the preparation for understanding of adjustment to and participation in the process of change. The environment in which a child is born is the product of social and physical conditions. The environment influences our life a lot.

#### *Advantages*

- (i) It is vital for any instructional strategy to focus its attention to the local environment, for making learning interesting and relevant.
- (ii) Environment based instructional strategies involve the child in activities using objects and situations from the world around him, leads him to think for himself, enable him to develop curiosity and links together many subjects.
- (iii) An environmental instructional strategy requires the teacher to spend some time in planning. The children involve themselves in various activities. This increases their urge to learn, and the interest aroused in both teacher and student makes it more meaningful. The students in this way start learning to learn for themselves.
- (iv) In the environment based teaching-learning process, the child is an active participant. The teacher remains flexible and does not rigidly follow the syllabus. The use of environment as a medium

for education enables one to use real life situations as the basis of inquiry learning, particularly with younger children.

- (v) It helps us in conserving or improving the environment.
- (vi) This approach gives plenty of opportunity for group activity leading to a number of skills.
- (vii) An environment based instructional strategy lays greater emphasis on the development of skills.
- (viii) It enables us in making instructional strategy more relevant to local environment.

#### *An illustration*

The environmental approach is very useful in teaching subjects like social studies more meaningfully. We can use our environmental resources effectively in the following ways :

- (a) The use of environmental resources form an essential aspect of the content of social studies.
- (b) The use of historical resources like places of historical interest archaeological excavations, monuments, museums, etc., makes teaching of social studies both purposive and purposeful.
- (c) The use of geographical resources like water, soil, forest, minerals, crops, industries, etc., makes teaching of social studies effective.
- (d) The use of cultural resources like zoo, parks, theaters, fair, etc., help in understanding the cultural aspects and makes the teaching social studies more realistic.

Similarly in teaching general science when children are exposed to environment they become inquisitive and try to seek answers to many problems and gain functional knowledge through careful study of the things around, in the environment. The teacher should organize the instructional strategy in such a way that children are not confused in seeking answers to numerous problems and issues related to the entire environment. It is better to divide the environment in small units for effective study without losing sight of the relationship of certain things with the entire environment.

#### **3.4.4 : Child and Teacher based Strategies**

In the modern context of education both the child and the teacher based instructional strategies play a prominent role. The Child is now the centre of all the curriculum process. The relevance of the curriculum to the personal and social needs of children and schools is the corner-stone of any effective instructional strategy. Similarly the success of any instructional strategy depends on the quality of teacher which, in turn



depends to a large extent on the quality of teacher education programme. The key role of today's teacher is to adapt a suitable curriculum to the needs of growing individual children. In the absence of these adaptations the curriculum is irrelevant.

### 3.4.5 : Development of Teaching Skills

The development of teaching skills plays a vital role in the teacher's effectiveness and makes teaching functional. The teaching skill has been defined differently by different exponents. All those definitions specify that a teaching skill is a group of teaching acts/behaviours intended to facilitate pupils' learning directly or indirectly. For an effective use of the school curriculum the development of appropriate teaching-learning strategies through which a teacher can achieve the goals of instructional objectives is a must and an instructional strategy is nothing but a constellation of certain planned activities for achieving the above objectives. The teacher can understand and utilise a strategy if he is able to analyse it in terms of the specific teaching tasks involved in it. So there is a need of specific teaching skills in a variety of teaching-learning situations, which would help in the attainment of the instructional objectives. The NCERT document on "Teacher Education Curriculum—A Frame work" (NCERT 1978) has classified a list of teaching skills under three major heads for the secondary level.

- (i) Intellectual skills related to content and methods.
- (ii) Psychomotor skills for teaching.
- (iii) Skills conducive to good human relations for maintaining social climate in the classroom.

#### 1. Intellectual skills

- Identifying and selecting the content appropriate for a particular class.
- Analysing the content into portions related to factual, conceptual, applicational, and theoretical learnings.
- Analysing further the classified contents into behavioural objectives related to the cognitive, psychomotor and affective domains.
- Translating them into instructional problems.
- Identifying the implicit mental process in these problems.
- Stating concepts, behavioural objectives and mental processes.
- Correlating these to pedagogical principles.
- Identifying, selecting, devising, originating and enriching learning experiences appropriate to achieve the stated objectives.
- Framing instructional questions of differing complexity and difficulty.
- Making appropriate choices from among the various forms of questions according to stated objectives.

- Identifying, selecting, devising and creating unfamiliar but reliable and valid testing situations to measure higher mental processes, interests, attitudes and values.
- Developing lesson plans and evaluation tools, combining all the above mentioned components.

## 2. *Psychomotor skills*

- Non-verbal (Motor) Skills.
- Positional/Postural/Locomotor skills.
- Writing on the black board.
- Demonstrating/conducting experiments.
- Handling and presenting various audio-visual aids such as charts, projectors, over head projectors, microscopes, etc.
- Verbal (communication) skills.
- Listening, reading and writing skills.
- Narrating, explaining, acting, questioning, articulating, expressing, modulating, etc.

## 3. *Skills conducive to Human Relations*

- Securing pupil's involvement and participation in ongoing learning.
- Developing rapport with them by handling pupil's cognitive, psychomotor and attitudinal responses through verbal and non-verbal feedback.
- creating permissive yet goal directed interactions in the class room.
- Dealing sympathetically yet firmly with problematic and embarrassing social situations arising in the class room.

### 3.4.6 : Microteaching

Microteaching as a technique for the acquisition of teaching skills by student-teachers was designed in Stanford University, U.S.A. by D.W. Allen<sup>2</sup>. It is a skill-based training technique. The technique is based on the promise that teaching is a complex skill which can be broken down into a set of a simple skills. The trainee acquires mastery over each of the skills in a simplified teaching situation. Microteaching is defined as a scaled-down teaching encounter wherein one skill is practiced at a time. The microlesson is based upon a single concept. The duration of the lesson varies from 5 to 10 minutes. The lesson is taught to a group of pupils ranging from 5 to 10. In other words, complexity of the teaching situation is reduced by using (a) small sized class, (b) smaller period of time, (c) Single concept lesson (d) Single skill lessons. The most important

2. D.W. Allen, "Microteaching" : A Description California, Stanford University, 1966.



point in micro teaching is that teaching is practised in terms of definable, observable, measurable, and controllable teaching skills. Feed-back is also an important component of this technique.

#### *Microteaching setting*

The following is the normal microteaching setting under the standard procedure ;

(a)	Time :	
	Teach :	6 mts
	Feed-back :	6 mts
	Re-plan :	12 mts
	Re-Teach :	6 mts
	Re-Feedback :	6 mts
<hr/>		
	Total	36 mts
<hr/>		

- (b) Number of pupils : 10  
 (c) Supervisor : 1 or 2  
 (d) Feedback by the Peer Supervisors.

### **3.4.7 : Educational Technology**

The utilisation of Educational Technology plays a prominent role in the development of instructional strategies. Educational Technology is a systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of specific objectives, and employing a combination of human and technical resources to bring about more effective instruction. Educational technology includes work in the fields of :

- The psychology of learning,
- Audio-visual methods of presentations,
- Educational Broadcasting,
- Educational planning and organization,
- Curriculum development of learning system,
- Information system,
- Evaluation,
- Allocation of resources and studies in cost effectiveness.

Educational technology is an area of study and practice (within education) concerned with all aspects of the organization of educational systems, sub-systems and procedures whereby resources are allocated to achieve specified outcomes. Thus, it can be applied as much to the

development of science equipment or material, as to environment or population education or to media such as Films, TV, Radio etc.

The Educational Media could be broadly classified into three categories :

- (1) Low Cost (charts, models, flashcards etc.)
- (2) Medium cost (Slides, filmstrips, audio-tapes etc.)
- (3) High cost (Film, Radio, Television CCTV, CAI).

In the western countries the potentialities of the High Cost Media is now well recognised. Keeping our Indian condition in view we are not in a position to provide high cost media to all our schools so we have to rely on low cost and medium cost aids.

There is an urgent need to develop educational media in the Indian context. Science is universal but technology is not. In the Indian situation media has to be used in a way which would best suit the rural school and its teachers. Low cost aids can reach each and every school and medium cost aids can reach the teacher training institutes etc. We can develop multi-media kit of low and medium cost aids without the use of machines etc.

#### 3.4.8 : Test Yourself

1. Explain briefly the role of instructional strategies relevant to objectives.
2. Suppose you have to teach a unit of social studies to the tenth class students. Draw an outline of the environmental resources for its teaching.
3. How can we utilise educational technology effectively in our schools?
4. Explain briefly the role of classroom based instructional strategies in our teaching learning process.
5. Why is a good learning environment an essential factor for an effective instructional strategy?

#### 3.4.9 : Correct Answers

Q. No. 1. Ref. 3.4.1 and 3.4.2

Q. No. 2. Ref. 3.4.3.

Q. No. 3. Ref. 3.4.7

Q. No. 4. Ref. 3.4.2

Q. No. 5. Ref. 3.4.2 (i)

#### 3.4.10 : Suggestions for further readings

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  - (iii) Comprehensive Access to Primary Education (1979).
  - (iv) Innovations in Education in India (1978).
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  - (viii) Teaching skills for effective use of Schools curriculum at the primary level (NCERT), (1980).
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## MODULE 3.5

### PLANNING A TEACHING UNIT

#### 3.5.1 : Need of Planning

In every activity, including Education, Planning is a must. The present era is a planning-era. Without planning, a nation or an individual can not move a step forward. This shows that for any activity, of a group or an individual, planning is a pre-requisite. Planning is the backbone of school administration, but we shall restrict its scope to the teaching-learning process.

Good teaching does not just happen. It requires adequate and extensive planning so that the objectives, the specifications, the teaching strategy to be employed, the textual material and the evaluation procedure are all related in some meaningful fashion. Most teachers recognise the importance of having some systematic procedure for ascertaining the extent to which the objectives and the specifications have been realized by their pupils.

#### 3.5.2 : Values of Unit Planning

The unit planning is likely to ensure more integrated, meaningful learning experiences for students. Unit planning incorporates a great variety of learning activities, such as reading, writing, speaking, listening, dramatizing, experimenting, cooperative planning, researching and



reporting. Further more, unit planning makes use of many different kinds of learning aids, such as audio-visual aids, electronic devices, laboratory equipment, and community resources. The unit planning makes adequate provision for individual differences within the classroom possible. Because of the rich and varied materials and activities that a well-developed unit has to offer, more opportunities for student choices, greater appeal to diversified interests, and better use of a variety of talents are assured. Better integration of content from different subjects is possible within the framework of unit organization for instruction. Better continuity in learning can be achieved in unit teaching. Classroom procedures are less likely to be dominated by the teacher under unit planning. Unit planning is based upon sound psychological principles of learning. The unit emphasizes learning by wholes, continuity of learning, and integration of students' learning experiences. With more student involvement made possible by the unit approach to teaching, a higher degree of motivation is likely to occur.

### 3.5.3 : Definition of a Unit

"A unit consists of a comprehensive series of related and meaningful activities so developed as to achieve pupil purposes, provide significant educational experiences, and result in appropriate behavioural changes".<sup>1</sup> It may also be defined as "a large subdivision of the subject matter wherein a principle or a topic or a property is central to the well-organized matter".<sup>2</sup>

The unit may be simply defined as a means of organizing instructional activities and materials into larger, related, unified patterns of learning in order to achieve significant educational objectives. According to Burton, "The important thing is to provide a combination of subject matter and processes which will have real meaning for the learner, which will aid him in continuously integrating his learning".<sup>3</sup> The Dictionary of Education describes the unit as "an organization of various activities, experiences, and types of learning around a central problem or purpose, developed cooperatively by a group of pupils under teacher leadership".<sup>4</sup>

1. H.C. Horrison, "The practice of Teaching in the Secondary School", Chicago : University of Chicago, 1961 p. 25.
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### 3.5.4 : Formation of Unit

A unit should satisfy the following criteria :

- (a) It should signify the unity or wholeness of learning activities related to some problem or project;
- (b) It should emphasise the psychological principle of "learning by whole";
- (c) It should give importance to the integrated learning outcomes;
- (d) It should not represent the subject matter only but the learning experiences as well;
- (e) It should emphasise the organization of the subject matter into units of experiences;
- (f) It should organize similar type of content;
- (g) It should be organized in such a way that it achieves a certain set of specific instructional objectives.

Here are some of the examples of units :

*History* : (a) Ancient culture; (b) The Moghuls; (c) The Marathas; (d) What we owe to the British; (e) Independence Movement; (f) India before 1947; (g) India after 1947.

*Geography* : (a) Seasons; (b) Winds; (c) The Equatorial region; (d) Neighbours of India; (e) Rocks; (f) Forests; (g) Minerals.

*Language* : (a) Letter writing; (b) Stories; (c) Essays; (d) Dramas; (e) Idioms; (g) Prepositions.

*General Science* : (a) Light; (b) Magnetism; (c) Electricity; (d) Heat; (e) Water; (f) Sound; (g) Energy.

*Mathematics* : (a) Set theory; (b) Number systems; (c) Symmetry; (d) Similarity; (e) Congruency; (f) Mensuration; (g) Graphs.

### 3.5.5 : Characteristics of a Good Teaching Unit

1. *The Unit is organized around purposes of the learner* : The most significant developments in the teaching-learning process for the past fifty years have emphasized the importance of pupil purposes in the learning activity.

2. *The Unit is Unified* : It should consist of a series of related and meaningful activities and a wholeness in organization. There must be a natural cohesion and coherence in the unit organization.

3. *The Unit provides a place of beginning and ending* : It should suggest to the learner, and to the alert teacher, where he should begin and clearly indicate the point at which he might reasonably conclude his efforts.



4. *The learning activities of the unit are educationally significant* : Activities to be educationally significant must be those which the pupils recognize will contribute to the goals they seek. They should be appropriate for the learners needs, interest and age group.

5. *The Unit is comprehensive* : One of the distinct values attributed to the unit organization is that the focussing of attention upon a relatively large unified learning situation tends to insure unity in the total learning experience of the pupil.

6. *The Unit is practicable in the given setting* : Units of learning which are educationally significant and practicable for development in a rural community may have little value and be wholly impractical for carrying out at an urban centre, and vice versa

7. *The Unit provides for a variety of activities* : Both within a given unit and in the use of several units there should be a wide variety of activities to facilitate all forms of learning. One of the advantages claimed for the unit has been that it provides for individual difference within the class. A properly organized and conducted unit will cater to a wide range of interests of the pupils through a variety of individual and group activities on various phases of the unit problem-situation.

8. *The Unit provides the basis for its evaluation* : A good unit will be so clear in its statement of a goal that the pupil and teacher can set up in advance the broad criteria of successful achievement.

9. *The Unit involves full teacher-pupil cooperation* : The development of unit idea has steadily given greater emphasis to the places of pupil purposing in learning. This in turn has been reflected in the larger place given to teacher-pupil planning and development of the unit. It is the idea of modern unit teaching that every phase of the unit process should represent cooperative planning by teacher and pupils in the realization of pupil purposes. The teacher, as a guide of youth in learning, identifies himself with the pupil. This is the cardinal characteristic of all good unit organization and unit teaching.

10. *A good Unit stimulates further action* : It is the experience of most teachers engaged in unit teaching that a good unit suggests to pupils more leads for further profitable study. It stimulates pupils' motivation for further action.

### 3.5.6 : Steps to Planning a Teaching Unit

An outline of the major divisions would consist of the following titles :

- I. Setting and overview
- II. Outline of topic or problem

## III. Objectives

- (a) General
- (b) Specific

## IV. Learning Activities and Instructional Materials.

- (a) Initiatory or Introductory
- (b) Developmental
- (c) Culminating

## V. Evaluation

## VI. Bibliography

- (a) Student
- (b) Teacher

## 3.5.6 (I) : Setting and overview

It includes such items as unit title, subject and grade level (for example, Social-studies X), and approximate time limit of the unit. For all practical purposes the unit title should be concise, descriptive, and interesting. It should also suggest the unifying principle around which the unit is organized. To be usable it should centre around some major understanding, problem, issue of theme; fit the course objectives and further the course plan; be relevant to pupils' lives and the society in which they live; be manageable, not too difficult, not too big or demanding too much time and too many resources. It should suit pupils' abilities and interests.

Note the different unifying principles in the following examples :

- Problem (Physiology) : "How does diet affect one's health" (or Diet in relation to health)
- Project (Industrial arts) : "How can an automobile owner get more service from his car?"  
(or Automobile)
- Topic (Social Studies) : "India and World Peace"
- Generalization (Science) : "Water is important for human survival"  
(or Water and Human Survival)
- Activity (Physical Education) : "How does football contribute to better use of Leisure time?"  
(or Football for recreation)
- Project (Home Science) : "How can a Housewife prepare an attractive balanced meal?"  
(or Preparation of balanced Meals)

The teacher may take into consideration "the level of maturity, the experimental background, the purposes, needs and interests of the learner". The most effective planning makes student experience the focal point of



teaching and utilizes the subject matter as a means to an end, namely, the improvement of the quality of student experience.

The overview broadly outlines the purpose and content of the unit, relating it to the preceding units and to the course as a whole.

### 3.5.6 (II) : Outline of topic or problem

It gives structure or body to the unit in terms of a definite scope and sequence of activities and materials. Some teachers find it helpful to draw out a content outline of topics (history), Problems (Science), or activities (Physical Education). For illustration let us give a unit outline on "climate" for class IX in Physical Geography.

*Unit Climate (Periods 20)*

- (i) Temperature——horizontal distribution——  
summer and winter conditions.
- (ii) Pressure and Winds——horizontal distribution  
——summer and winter conditions.
- (iii) Precipitation——horizontal distribution——  
summer and winter conditions.
- (iv) Climatic regions.
- (v) Climate of India in detail.

Let us give a unit outline in Life Science subject, for class IX, on "Life Processes".

*Unit Life Processes (Periods 15)*

- (I) Nutrition.
- (II) Photosynthesis.
- (III) Respiration.
- (IV) Internal Transport.
- (V) Excretion.
- (VI) Movement and Locomotion.
- (VII) Reproduction.
- (VIII) Growth and Development.
- (IX) Control and Coordination.

Let us give a unit outline in Psychology subject, for class X, on "Learning and Adjustment in School".

*Unit Learning and Adjustment in School (Periods 6)*

- (I) Processes of Learning and remembering.
- (II) Performance.
- (III) Study and practice habits.
- (IV) Abilities and Intelligence.
- (V) Need achievement.
- (VI) Interpersonal relations in School.

**3.5.6 (III) : Objectives**

Unit development begins with the selection of objectives. They give direction to everything that the teacher and his students have to do. The teacher must regard them as the functional and practical aspects of the total plan. Today, many factors are considered necessary in the selection of objectives. Most important are analysis of students needs, contemporary society, and the learning process.

*Criteria for Unit Objectives**(a) The unit objectives must be achievable*

It is futile for the teacher to set up idealistic and unattainable goals. It is educationally unsound to gear instruction below the maturity and achievement levels of the students or to set the level of instruction beyond their attainment. The objectives should be related with the maturity and experience levels of the class, available resources and feasible learning activities, the complexity of the problem or topic, and the competence of the teacher; all these factors determine whether a given set of objectives is achievable or not.

*(b) Objectives must provide for diversity*

They should be related to the task of educating all the boys and girls showing a great diversity of interests, needs, abilities and backgrounds. The teacher in the classroom can never escape the responsibility for individualizing instruction in order to meet the needs of all the students.

*(c) Objectives must be both Personal and Social*

The schools are obligated to develop good citizens and at the same time strive for the development of the unique qualities of each individual citizen. Thus a precise balance between education for uniformity and education for diversity must be maintained.

*(d) Objectives must be amenable to Evaluation*

When a teacher lists his unit objectives, he should consider the kind of evidence he will need to evaluate student achievement in each one of course, both formal means (such as unit tests) and informal means (such as teacher observations) may be used to collect data for evaluation. It should be a continuous process.

*(ii) General objectives*

The general objectives of the unit should be written as an overview of the unit describing the major concept that pupils should learn. The



general objectives section of the unit should list the general skills, attitudes, appreciations, ideals that is hoped the pupils will acquire from studying the unit.

*(ii) Specific objectives*

In specific objectives of the unit, specific learning products should be written as descriptions of the specific concepts, attitudes, or skills to be learned. The important considerations should be that the specific goals must contribute to the larger goal, and they must be specific enough and clear enough both for the teacher and the pupils. In addition, the objectives must be achievable in the time allotted and with the resources available ; and allow for individual differences in pupils abilities, interests, needs and goals.

**3.5.6 (IV) : Learning activities and instructional materials**

The heart of a unit consists of learning activities and instructional materials. The teacher must spend a good deal of effort in preplanning the units in which attention needs to be devoted to the selection of the best activities and the resources available. The learning activities must be really suitable for the objectives, and in keeping with the time, material, equipment and other resources available. They should not be too difficult or too easy. The list should include the audio-visual media, library resources that may be had. The learning activities can be classified as :—

- (i) Initiatory or introductory activities
- (ii) Developmental activities
- (iii) Culminating activities.

*(i) Initiatory or Introductory activities*

The initiatory or introductory activities serve several purposes. They help to determine what the students already knows about the proposed unit, to relate students' interests, backgrounds and abilities to the new unit ; and to motivate the class to pursue the study of the unit with enthusiasm. The teacher is the key factor in arousing students' interest in a new unit. He needs to be imaginative, alive, and sensitive to the concerns of the youth. For arousing interest, the teacher may use a number of approaches, like direct experience, personalizing problems, excursions, audio-visual aids, well-chosen selections, etc.

*(ii) Developmental activities*

The developmental activities need to be extensive and varied, for they constitute about everything the teacher and class do to achieve the

objectives of the unit. Just before listing tentative learning activities and relevant instructional materials, the teacher should include an outline of topics or problems to be covered. This provides the skeleton or framework around which learning experiences may be organized. The learning experiences should keep in view the individual differences. For example, slow learners need more concrete instructional materials, simpler concepts, easier reading materials, and more frequent reviews. On the other hand, gifted students need more complex problems, more opportunity for individual research, and more breadth and depth of content to challenge them. The teacher must develop learning activities based on first hand experiences, as far as possible. In selecting most effective learning activities for a unit, the teacher needs to stress action toward desirable goals relevant to the objectives of the unit. What the students do determines what they learn.

### (iii) *Culminating activities*

The culminating activities are designed to summarize, review, and to re-emphasize the central unifying theme or problem of the unit. The teacher does well in encouraging students to share interesting discoveries or significant products of research with their classmates. The following activities are typical : an exhibit of student's work (art), a tournament (Physical education), a series of committee reports (Social Science), etc. It is very important for an effective teacher to protect the class from boredom. Learning is an active and interesting process.

### 3.5.6 (V) : Evaluation

The criteria and procedures for evaluation need to be stated in terms that are definite, clear and acceptable. It should be a continuous process. When all evaluation data are in, every one concerned should know how well unit objectives have been achieved. There are several approaches to evaluation. First of all the teacher and the class may co-operatively evaluate the successes and failures experienced in the development of the unit, as a guide to future operations. Another phase of evaluation is that the teacher evaluates his own teaching of the unit. Certainly no unit evaluation is complete until the teacher has gathered all available data concerning the progress of each student and has translated it into a mark or grade to be used in progress reports to parents and as part of the cumulative record of the student. Final marks or grades are part of the student's permanent record ; hence each member of a class has a right to know in advance what criteria and procedures will be used by the teacher in evaluating his work for each unit.



### 3.5.6 (VI) : Bibliography

A list of selected references, sometimes one for the students and another for the teacher, is included at the end of a unit. To supplement the materials suggested in the body of the unit, Appendices may be added that would include charts and graphs, word lists, suggested class organization and other miscellaneous items.

### 3.5.7 : Unit Plan Vs. Daily Lesson Plan

A daily lesson plan is a plan showing the teaching points, specifications to be achieved, organisation of learning activities in detail and the actual test items to which students are to be exposed.

(a) A unit may extend over more than a period, it may take 10-12 periods, depending upon the subject matter, the specifications to be achieved and the learning activities to be organized, while a daily lesson plan is confined to one period only.

(b) In the unit plan, the content is grouped under the headings of terms, concepts, facts, generalisations, principles, etc., while in the daily lesson plan the content is presented in the form of teaching points and is serialised in a psychological or logical sequence.

(c) In a unit plan, the learning activities are merely mentioned, while in a daily lesson plan they are shown in detail. The unit plan should give a clear idea to the supervisor of what the teacher and pupils are going to do at a particular time during the learning process.

(d) In a unit plan, the types of evaluation tools and techniques are mentioned, while in a daily lesson plan the actual test items to be administered to the pupils are given. The test items may be of essay or objective or short-answer type questions.

(e) Daily lesson plans should be within the content of the over-all unit and should be continuous from day to day. The work of each day should be in a way, an extension and continuation of the previous day's work.

### 3.5.8 : Test Yourself

1. Explain briefly the successive steps in planning a teaching Unit.
2. Distinguish between a unit plan and a daily lesson plan.
3. What points should be kept in mind while planning a teaching Unit ?

### 3.5.9 : Correct Answers

Q. No. 1. Ref. 3.5.6

Q. No. 2. Ref. 3.5.7

Q. No. 3. Ref. 3.5.5

**3.5.10 Suggestions for Further Reading**

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  - (i) Minimum Learning Continuum (NCERT), (1979).
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  - (iii) Educational objectives at the primary stage—A developmental approach (1978).
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## SECTION 4.0

## EVALUATION

(A) ELEMENTARY STATISTICS

(B) EVALUATION IN EDUCATION



SECTION 4.2

EVALUATION

- (A) ELEMENTARY STATISTICS
- (B) EVALUATION IN EDUCATION

## MODULE 4 (A) 1

### CLASSIFICATION AND TABULATION OF DATA

#### 4(A) 1.0 : Specific Objectives of the Module

Having studied this Module, you are expected to be able to :

- (i) tell the meaning of the 'term' classification.
- (ii) tell the drawbacks of the classification of the traditional examination results in different divisions and the failure group.
- (iii) narrate the statistical conventions for dividing a set of scores into class intervals.
- (iv) to set up class intervals for drawing a frequency distribution table of a set of scores.
- (v) to sort out the scores in different class intervals by putting down tally marks.

#### 4(A)1.1 : Classification

How does a big post-office rearrange the large number of letters that it receives every day, in order to make their distribution easy? You must have seen that they are sorted out or classified into smaller lots in pigeon-hole racks.

What is common in the letters of one pigeon-hole or class? They all belong to one sector of the town.



How do letters of different pigeon-holes or classes differ from one another? They belong to different Sectors.

Complete the following sentence by filling in the blanks :

'Classification is.....of a large group into smaller sub-groups with a purpose, in such a way that the members of each sub-group are..... in some respect, in keeping with the purpose, and the members of the different sub-groups are.....in that respect.' (If in doubt read the above matter again).

According to what are the books in the University or College libraries classified? They are classified according to SUBJECT.

Into how many classes are the candidates classified in the results of the Public Examinations, for the calculation of percentages of results? They are usually classified as Failed, III Division, II Division, and I Division.

#### 4(A) 1.2 : Meaning of 'Table'

Probably you know that the recording of facts and figures in an orderly manner in Tables, usually with columns, is called 'Tabulation'. Here we are concerned with tabulation of facts and figures pertaining to some classification, show the number of cases in different categories or classes. The categories may be the classes or grades of some school, the sectors in a town, the two sexes, the areas of habitation, etc., or portions of a measuring scale, e.g., if there are 100 marks in a subject, the candidates may be classified and grouped on the following parts of this scale of marks from 0 to 100.

60 to 100 (I Division)

48 to 59 (II Division)

33 to 47 (III Division)

0 to 32 (Fail).

This is the usual break-up. It may differ in some Universities.

Now if we put the number of cases (Candidates), known as Frequency, that may be there in each portion of the scale, called Class-Interval, the Tabulation will be complete.

Class-Interval (ci\*)

Frequency (f\*)

60—100

25

48—59

150

33—47

200

0—32

125

Total No. of cases (N\*) 500

\*It is these abbreviations that are generally used in the Tables.

**4 (A) 1.3 : Drawbacks of Classification in Exam. Result Tables**

You will find that in the above Table the class-intervals are unequal. The size of the Failed class-interval is of 33 marks,  $32 - 0 = 32$ , and  $32 + 1$  (since both the end scores 0 and 32 have to be included) is equal to 33. The size of the class-interval or III Division is of 15 mark units and of the II Division of 12 units. What is the size of the class-interval of the I Division? If you calculate correctly, it will come to 41.

Another drawback of the above Table is that the number of the class-intervals is too small, only four, and hence, they are rather too broad. For example, the range of the 'Failed Class' is from 0 to 32, which is too long, with the result that even those who fail by a few marks only are tied with those who fail miserably by scoring only a few marks, and may be dubbed with them as good-for-nothing. This is why the candidates who miss to pass by a few marks only are so anxious to tell this fact. Of course, sometimes even those who do very badly cheat others by pretending to have failed by one or two marks only.

**4(A)1.4 : Statistical Conventions for Classification**

In order to differentiate or discriminate between the candidates better, that is, more finely, the statisticians divide the total scale of marks into equal and smaller class-intervals. For this they have developed the following conventions :

(1) Instead of dividing the total number of marks in the question paper into class-intervals, only the range of the marks actually scored by the candidates, that is, the difference between the lowest and the highest marks got by the candidates, is divided into class-intervals, e.g., if in a question paper of 100 marks, the lowest score is 11 and the highest 81, only the range  $81 - 11 = 70$  is divided into class-intervals.

(2) Generally the range of the scored marks, which may be called the effective range, is divided into 10 to 15 class-intervals of equal size.

(3) Usually the size of the class-intervals is of 2, 3, 5, or 10 units, since they are easier for calculations. One has to choose between them, keeping in view the second convention given above, e.g., if the effective range is of 70 mark units, more than 15 class-intervals will be needed if their size is of 2 or 3 units, while with a size of 10 units their number will be less than 10, hence, one will have to choose the size of 5, which will give  $70 \div 5 = 14$  class-intervals or one more, since the end intervals may exceed the limits of the effective range, because of the convention that follows.

(4) For facility in calculations, the lower limit of the lowest class-interval is either the same number as the size of the class-intervals, or a



multiple thereof, or a zero, any of these which may form a class-interval that will include the lowest score of the candidates. For example, if the lowest score is 11 and the size of the class-intervals already decided is 5, as in the above paragraph, the lower limit of the lowest class interval has to be 10, a multiple of the size of the class-interval '5' because it would include the lowest score 11 by forming the class-interval 10-14, which would include five types of marks, 11, 12, 13, 14, and 15, and all the candidates who get any of these marks will come in this class. On the other hand, if we start with 0 or 5, the lowest class-interval, 0-4 or 5-9 respectively, will not include 11, and as a matter of fact no obtained score at all, since no score is less than 11.

(5) Usually in Educational Statistics the class-intervals increase in value as we move in the Table upwards, that is, the lowest class-interval is at the bottom and the highest is at the top, in the following manner :

ci

80—84

75—79

70—74

65—69

60—64

55—59

50—54

45—49

40—44

35—39

30—34

25—29

20—24

15—19

10—14

You will see that the above column of class-intervals has been set up in accordance with the example that we have been talking of so far, that is, in a question paper of 100 marks the lowest score is 11 and the highest 81. Since the class-intervals at the two ends have gone beyond the effective range of marks, their number is 1 more than  $81 - 11 = 70$  divided by 5.

#### 4(A) 1.5 : Putting the Tally Marks

When the class-intervals have been set up, we classify the scores of the candidates in them. Suppose there are 70 candidates and their scores are as follows ;

26

34

46

22

47

48

36

26	51	42	51	43	54	42
11	59	81	55	53	61	40
40	47	52	20	47	78	41
44	71	46	52	56	46	33
45	61	63	19	67	37	46
64	58	65	36	56	52	38
25	68	50	37	72	48	43
47	55	50	57	32	41	38
45	40	47	30	35	35	60

We may take each score one by one and put a tally mark ( / ) in the class-interval to which it belongs, and there are four tally marks in a class-interval and a fifth one has to be put in the same interval, it is put as a cross bar over the four existing tallies. When a bunch of five is thus complete, the subsequent scores of that interval start afresh with a simple tally till another bunch of five is completed, and so on. If you proceed in this way and put the frequencies of the different class-intervals in figures, after completing and counting the tallies, your Table, which will be known as the 'Frequency Distribution Table', will look like this :

ci	f
80—84	1
75—79	1
70—74	2
65—69	3
60—64	5
55—59	8
50—54	9
45—49	12
40—44	10
35—39	8
30—34	4
25—29	3
20—24	2
15—19	1
10—14	1
	<hr/>
	N=70

When the process of sorting out the scores is not shown the Frequency Distribution Table has only the first and the last column and not the tally column.

#### 4(A) 1.6 : Test Yourself

(1) In a question Paper of 50 marks, the lowest score was 2 and the highest 49, set up the class-intervals for classifying the scores.



(2) Draw the Frequency Distribution Table of the following set of scores :

20	15	25	26	30	33	12	8	47	11
4	36	42	17	12	22	23	16	26	32
38	32	23	33	18	43	22	27	28	25
37	30	31	26	26	37	21	30	25	26
29	28	27	25	26	29	29	27	26	28

(3) What are the drawbacks in the present system of reporting the Exam. results in percentages of Failure, III Division, II Division and I Division ?

(4) How do members of one class compare among themselves and with the members of another class ?

#### 4(A) 1.7 : Correct Answers

(1) Make sure that you have followed the conventions, 2 to 5, mentioned in unit 4(A) 1.4.

(2) Follow the conventions, 2 to 5, of unit 4.1.4 and follow the procedure given in unit 4(A) 1.5.

(3) See unit 4(A) 1.2.

(4) See unit 4(A) 1.1.

#### 4(A) 1.8 : Suggestions for Further Reading

Garrett, H.E., "Statistics in Psychology and Education", Bombay : Vakils, Feffer and Simons (Pvt.) Ltd., 1971.

Guilford, J.P., "Fundamental Statistics in Psychology and Education", Tokyo : McGraw Hill Kogakusha Ltd., 1978.

Walker, Helen, "Elementary Statistical Methods", New York : Henry Holt, 1943.



## MODULE 4(A)2

### GRAPHICAL REPRESENTATION OF DATA

#### 4(A)2.0 : Specific Objectives of the Module

After studying this Module, you are expected to be able to :

- (1) tell the advantages of graphical representation of data.
- (2) scale the axes for the graphical representation of frequency distribution data.
- (3) draw a Bar diagram.
- (4) draw a Histogram.
- (5) draw a Frequency Polygon.
- (6) draw an Ogive.
- (7) draw a graph showing changes.
- (8) draw a bar diagram showing percentages.
- (9) draw a pie diagram to show percentages.

#### 4(A)2.1 : Need of Graphical Representation

Why is a SUMMARY appended to a long report that gives a detailed description of a situation with a number of facts and figures. The justification of a SUMMARY lies in the fact that one may lose sight of the forest in counting the trees, that is, we may fail to see how the entire forest looks like if we give all our attention to the counting of the trees only. A SUMMARY presents the facts and figures of a situation in a



brief and well connected form giving the reader a quick and over all view of the situation.

What will you do to present a jungle of data in an easily interpretable form, so that worthwhile conclusions may be arrived at? I hope that on the basis of your study of the previous section you will say that you will 'classify' and 'tabulate' the data, with respect to the purpose of your study or investigation. But will it sometimes not be still better to present the facts and figures in form of graphical diagrams? Could you give reasons for the effectiveness of the visual presentation of data in the form of graphs? "Garrett says," The advertiser has long used graphic methods because these catch the eye and hold the attention when the most careful array of statistical evidence fails to attract notice. For this and other reasons the research worker also utilizes the attention-getting power of visual presentation and, at the same time, seeks to translate numerical facts—often abstract and difficult of interpretation—into more concrete and understandable form."<sup>1</sup>

#### 4(A)2.2 : Sealing of Graph Axes

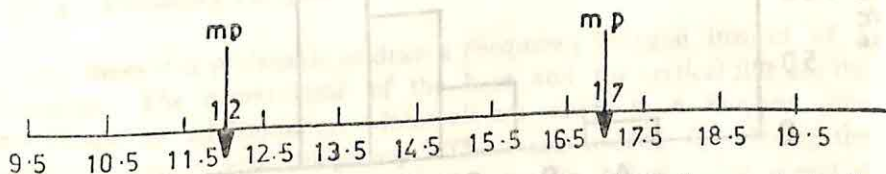
In graphical representation of a frequency distribution, the classes are placed on the horizontal line, called the 'Abcissa' or 'x-Axis', while the frequency in terms of the number of cases or proportions or percentages of cases is on the vertical line, called the 'Ordinate' or 'y-Axis'. The point where these axes meet is called the 'Origin'. As referred to in the last Module, the classes may be the sub-groups of some Quality, like Sex (Male, Female), Religion (Hindu, Muslim, Sikh, etc.), or equal portions of a Quantity, like Exam. scores, Height, Weight, Price, etc. In the former case the subgroups are shown on the x-Axis as small bits of equal space starting a little away from the Origin and having no scale value. Why? Because they are Qualities and not Quantities.

The quantity subclasses or class-intervals are represented by the scale values of the portion of the x-Axis which they cover. The x-Axis has a value of 0 at the begin', and is at the beginning a little wavy for a small space till the start of the lowest class-interval (for drawing a Histogram or Ogive) or a class-interval below the lowest one (for drawing a Frequency Polygon) if they don't start from O. The three types of drawing mentioned within the brackets here have been described below. After the wavy line the horizontal line has quantitative values according to the scale value of the divisions of the graph line on which it is drawn. It is decided by the graph drawer as to how many units of the quantity will be represented

1. H.E. Garrett, "Statistics in Psychology and Education", Bombay: Vakils, Feffer and Simons Pvt. Ltd., 1971, pp. 8-9.

by the smallest division of the line, .1 cm or .1", depending on the graph-paper being a marked in centimetres or inches. Suppose we can lay the origin at a place from where you can get a horizontal line of 10 cm or inches for the effective class-intervals, that is, the class-intervals with frequencies, besides space for the wavy line and one additional class-interval at each end with 0 frequency in case of the Frequency Polygon, and you have to represent a range of 100 scores, what will be the most convenient value for each small division of cm(mm) or inch (.1 inch)? You will naturally like to make each mm or .1" equal to one score as that would make the counting so easy. What scale will you choose for a range of 200 score? You will have to make each mm or .1" equal to 2 scores for want of space. If in these very circumstances you have to represent a range of 50 scores only, I think you will make 2 mm or .2" equal to 1 score.

The horizontal line is generally divided by marking the exact limits of the class-intervals and not the score limits. The difference between the two lies in the fact that a score on measurement scale is truly not a point but covers an interval or the scale, e.g., when we measure height to the nearest inch, anything less than .5" above the whole number of feet is ignored, as 0", but anything between .5 and 1.5" above the number of whole feet is 1". Similarly any point between 1.5 and 2.5 inches is 2". What are the exact limits of 3"? Exact 1", 2", and 3" are the mid-points of the ranges covered by them, viz., .5-1.5, 1.5-2.5, and 2.5-3.5 respectively. Hence, the exact limits of the class-intervals are different from their score limits which were mentioned in the last section, e.g., for the class-interval 10-14, the score limits are 10 and 14, but the exact limits will be 9.5-14.5, since the lower limit of score 10 is 9.5 and the upper limit of the score 14 is 14.5. What are the exact limits of the class-interval 15-19? After having written the exact ranges of the class-intervals, e.g., 9.5-14.5, 14.5-19.5, we may find out the mid-points of the class-intervals. How? By adding these limits and dividing the sum by 2. What are mid-points of the class-intervals, 9.5-14.5 and 14.5-19.5? If you have done it rightly, the answers will be 12 and 17, as is illustrated in the following diagram :



The decision for the frequency scale on the vertical line, y-Axis, has to be taken with the considerations that the counting should be easy and



the height of the figure in case of the Histogram and the Frequency Polygon should be about 75 per cent of the total distance of the class-intervals on the horizontal line so that the whole figure looks graceful, neither too low nor too high.

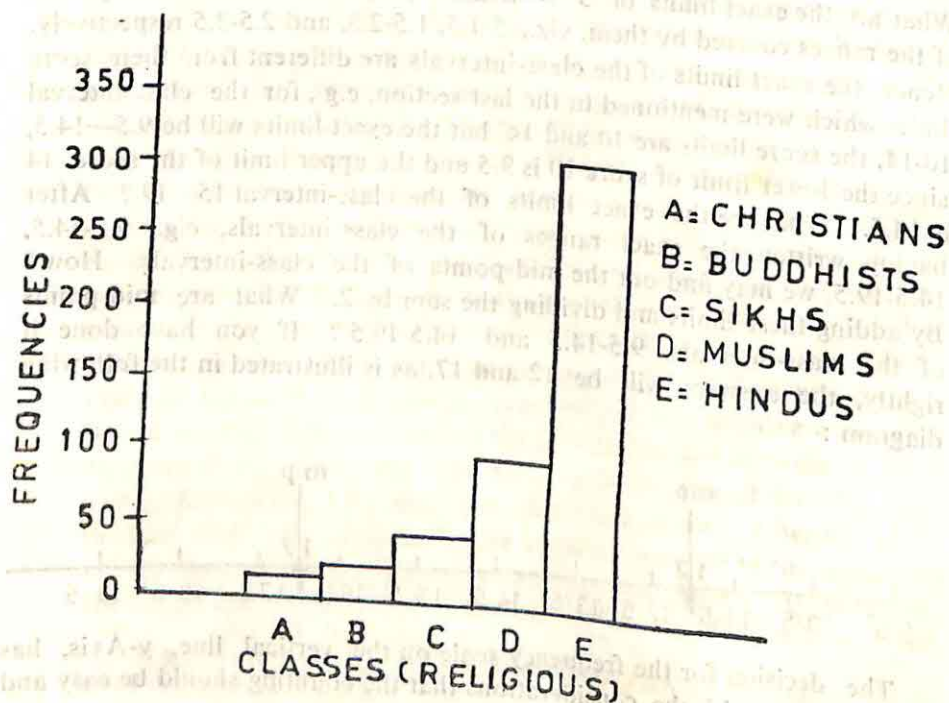
Now we are ready to make graphical representations of Frequency Distribution Tables.

#### 4(A)2.3 : Bar Diagram & Histogram

In the Bar-diagram as shown below, rectangles are drawn to represent the frequencies of different classes. The width of each rectangle covers the entire space on the horizontal line of a particular class and its length represents the frequency of that class. When such diagrams represent the frequencies of quantitative class-intervals, they are called 'Histograms'. Bar-diagrams of Qualitative, and Quantitative classes (Histograms) are given below :

1. In a High School the frequency distribution of the students of different religious communities is as follows :

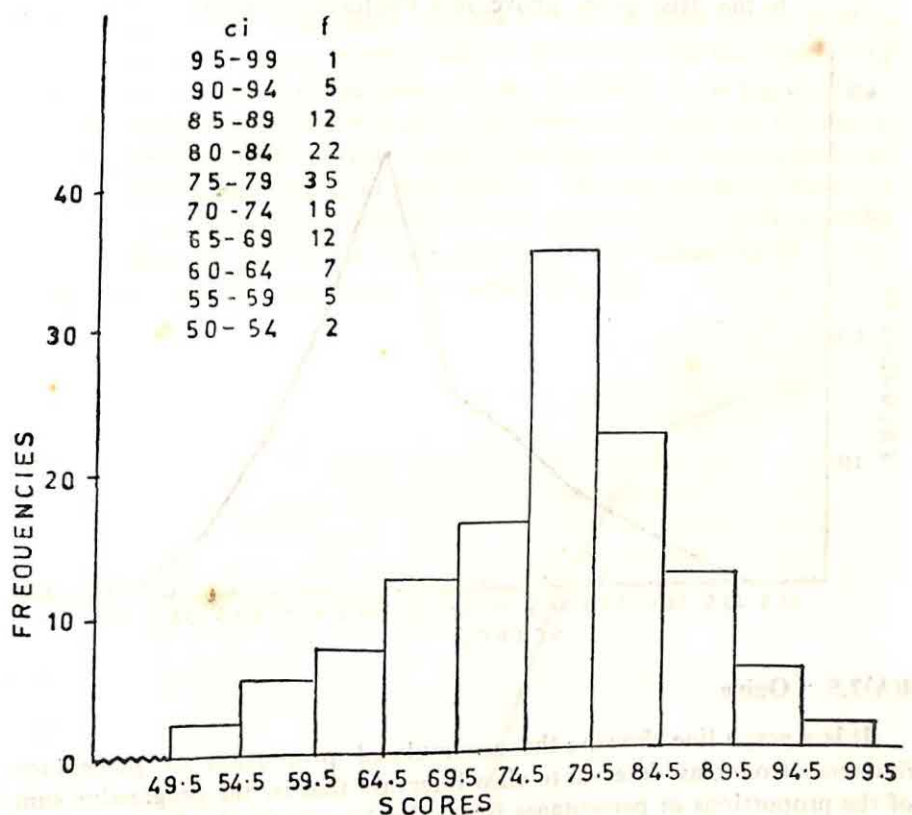
Religion	<i>f</i>
Christians	10
Buddhists	20
Sikhs	50



Muslims	110
Hindus	315

This is represented in the following bar-Diagram. As the classes here are Qualities and not Quantities the width of the bars is not according to any scale. It depends on what looks nice to the drawer.

2. The following distribution of the scores in an Examination is represented in a 'Histogram' given alongwith it.



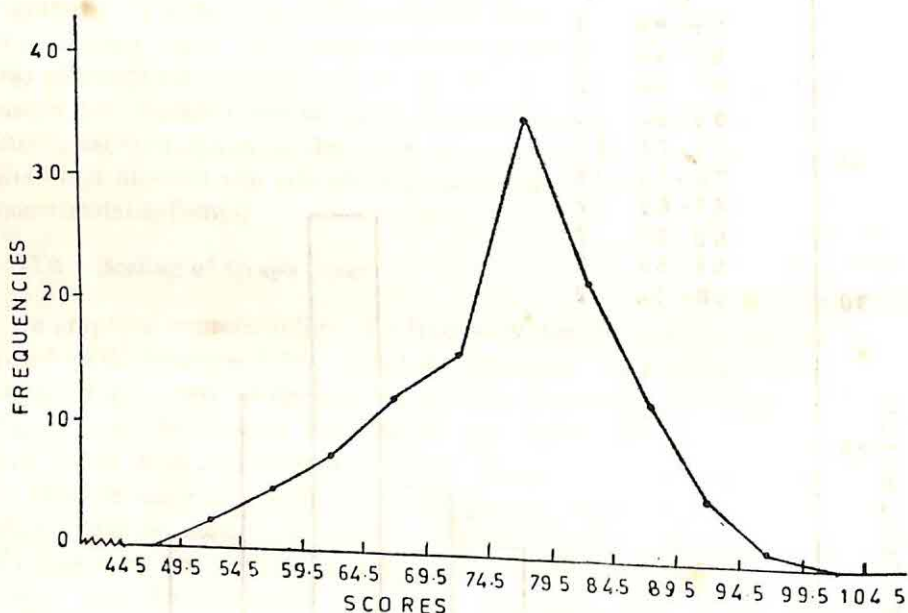
#### 4(A)2.4 : Frequency Polygon

Sometimes it is preferable to draw a Frequency Polygon instead of a Histogram. The demarcation of the base and the vertical line are the same except that additional class-intervals are needed in a Polygon, one at each end with a zero frequency. These are needed for closing the ends of the Polygon as you will see in the diagram below. One essential difference in a Polygon and a Histogram is that in latter the frequency is shown as spread over the entire class-interval, while in the former it is



shown as concentrated at the middle point of each interval, meaning thereby that all the cases in a class-interval are supposed (assumed) to have got the middle score of the interval, e.g., if there are 35 cases in the class-interval 75-79, it is supposed that all of them got 77 marks, though they may have actually got anything between 75 to 79, but as this is not recorded in a frequency distribution table, some assumption has to be made regarding their values.

*Example :* Represent the frequency distribution of the scores represented in the 'Histogram' above, in a Frequency Polygon.



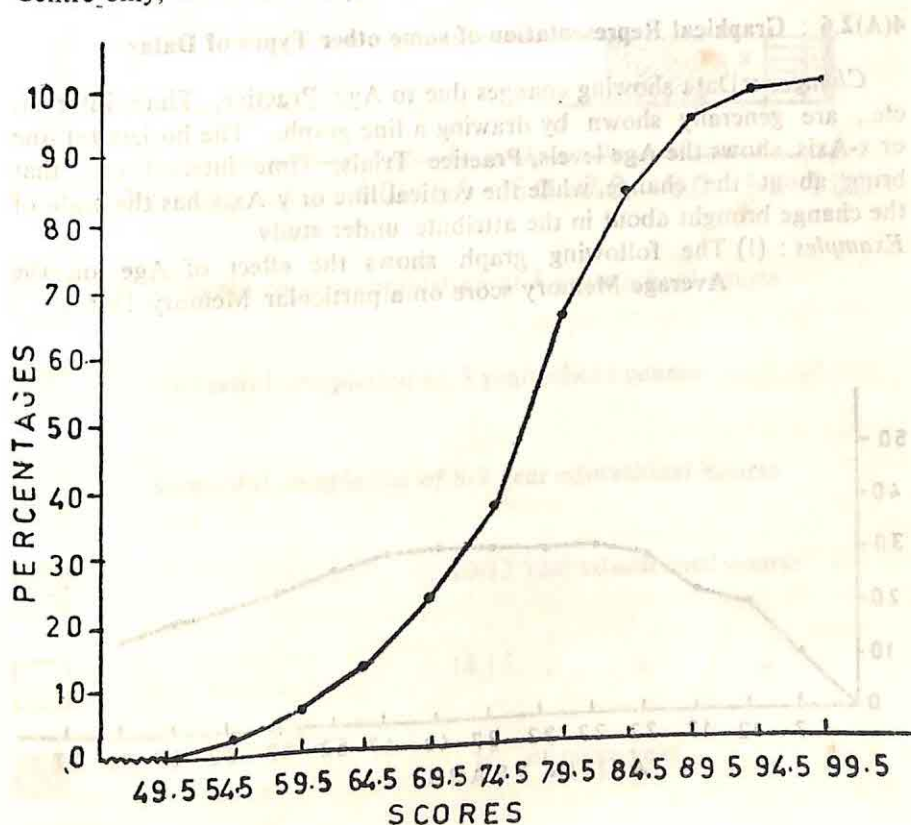
#### 4(A)2.5 : Ogive

It is a graph line showing the accumulated proportion or percentage frequency from class-interval to class-interval, that is, the progressive sum of the proportions or percentages from the lowest to the highest class-interval. It is helpful for the computation of the Percentiles of which we will talk in the next section.

As a preparation for drawing the Ogive, we have first to sum up the frequencies from class-interval to class-interval from below upwards, as shown in the third column of the Table of the Example given below. These are known as cumulative frequencies 'cf'. Then the accumulated frequency in each class-interval, that is, the sum of the frequencies in all the lower class-intervals added to the frequency of that interval, is expressed as the proportion or percentage of  $N$ . I hope you remember

that  $N$  is the total number of cases in the sample. The 'Cumulative Percentages' 'cP' are shown in column IV of the Table below. I hope you know the difference between 'Proportion' (P) and 'Percentage' (P). The former is out of 1 and the latter is out of 100.

In the Ogive the class-intervals on the base line are set in the same manner as in a Histogram, but it is the divisions of the Percentage or the proportion scale that are marked on the vertical line instead of the frequencies, and it is only the ease of counting that is kept in view and not the height of the figure. One thing more, you are to keep in mind that in plotting the cumulative proportion or percentage of each class-interval, the plotting point is put at the end of the class-interval, as shown in the Ogive below, since the cumulative cp or CP in each class-interval is based on the cumulative frequency of that interval, which is the sum of the frequencies of all the lower intervals as well as of that interval. The frequencies of the class-intervals are in these diagrams assumed to be spread all the intervals upto their end, as in the case of the Histogram, not to be concentrated at the Centre only, as in the case of the Frequency Polygon.





**Example :** Draw the Ogive of the distribution taken as an example under the 'Histogram' and the 'Frequency Polygon'.

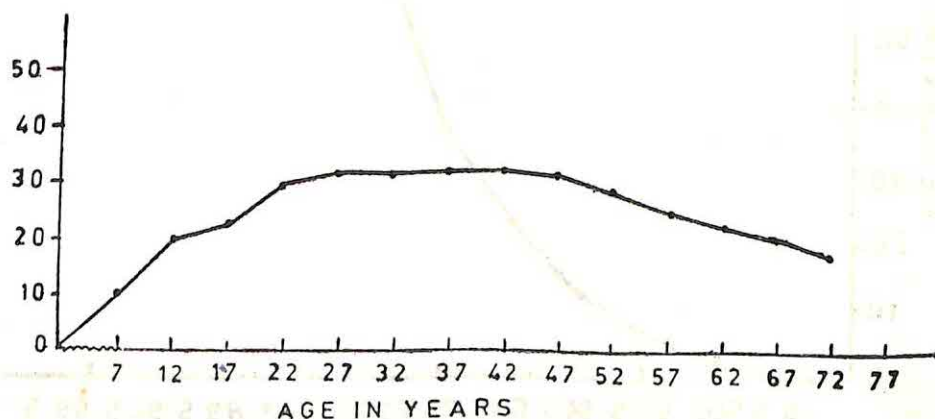
Table of cumulative Percentage (cP)

I	II	III	IV
ci	f	cf	cP (correct upto first decimal)
95-99	1	117	100.0
90-94	5	116	99.1
85-89	12	111	94.9
80-84	22	99	84.6
75-79	35	77	65.8
70-74	16	42	35.9
65-69	12	26	22.2
60-64	7	14	12.0
55-59	5	7	6.0
50-54	2	2	1.7

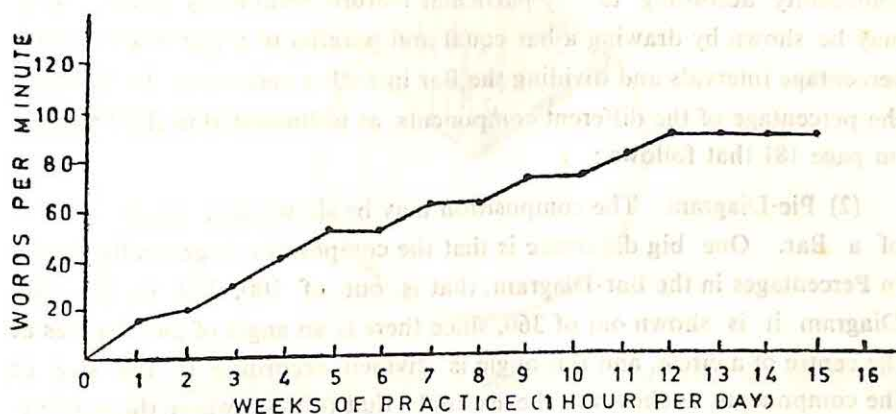
#### 4(A)2.6 : Graphical Representation of some other Types of Data

**Changes :** Data showing changes due to Age, Practice, Time interval, etc., are generally shown by drawing a line graph. The horizontal line or x-Axis, shows the Age levels, Practice Trials, Time interval etc., that bring about the change, while the vertical line or y-Axis has the scale of the change brought about in the attribute under study.

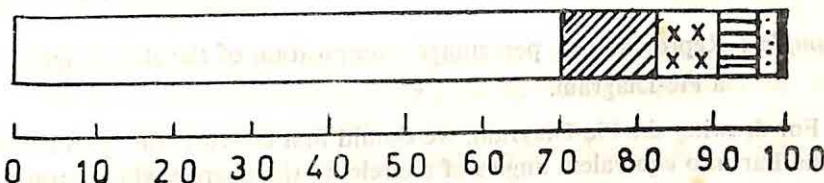
**Examples :** (1) The following graph shows the effect of Age on the Average Memory score on a particular Memory Test.



- (2) The average change in typewriting speed due to the number of weeks of practice by a particular system for an hour each day is shown in this graph.



Bar-Diagram showing the composition of the inhabitants of a city according to their educational levels, percentage-wise.



Illiterate on non-completion of 5 years school course



Successful completion of 5 year school course



Successful completion of 8-9 year educational course



„ „ „ 10-13 year educational course



„ „ „ 14-15 „ „ „



„ „ „ 16 or more year „



*Percentage Composition* : This may be represented in two ways :

(1) Bar-Diagram : The percentage-wise composition of a group or community according to any particular feature, technically called a trait, may be shown by drawing a bar equal and parallel to a line marked with percentage intervals and dividing the Bar in such a manner as to indicate the percentage of the different components, as is illustrated in the Example on page 181 that follows :

(2) Pie-Diagram : The composition may be shown in a circle instead of a Bar. One big difference is that the composition is generally shown in Percentages in the Bar-Diagram, that is out of 100, but in the Pie-Diagram it is shown out of 360, since there is an angle of 360 degrees at the centre of a circle, and this angle is divided according to the size of the components, as shown in the example that follows, where the percentages of the Bar-Diagram have been converted into angles at the centre of a circle. Percentages can easily be converted into angles out of 360, by multiplying each percentage with 3.6, since 360 times more than 100.

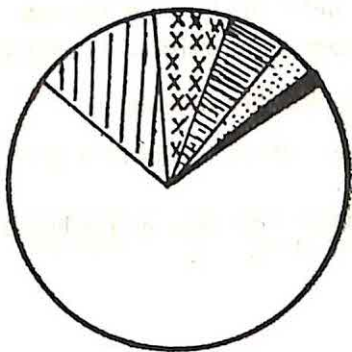
*Example* : Represent the percentage composition of the Bar-Diagram in a Pie-Diagram.

For drawing the Pie-Diagram, we should first convert the percentages of the Bar into equivalent angles of a circle, to the nearest whole number.

(1)	Illiterate or below 5 year schooling	$70 \times 3.6 = 25.2^\circ$
(2)	Successful completion of 5 year school course	$13 \times 3.6 = 46.8^\circ = 47^\circ$
(3)	Successful completion of 8-9 year course	$8 \times 3.6 = 28.8^\circ = 29^\circ$
(4)	„ „ 10-13 „ „	$5 \times 3.6 = 18^\circ$
(5)	„ „ 14-15 „ „	$3 \times 3.6 = 10.8^\circ = 11^\circ$
(6)	„ „ 16 or more year course	$1 \times 3.6 = 3.6 = 3^{\circ*}$
		Total 360°

\*It has been kept at 3°, since 4° increases the total beyond 360°

## THE PIE DIAGRAM



**Note :** The markings in the different sectors are the same as in the bar-diagram.

In case two or more comparisons are to be made, Pie-diagrams in Circles of equal diameter should be drawn side by side.

**4(A)2.7 : Test Yourself**

- (1) Why is the graphical representation of data so effective ?
- (2) What is the difference in the plotting of the frequencies in 'Histogram', 'Frequency Polygon' and 'Ogive' ?

(3) Represent the following Frequency distribution in a 'Histogram' a 'Polygon, and an Ogive'

ci :	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44
f :	4	18	30	65	35	20	10	5

(4) Draw the temperature graph of a patient with the help of the following data :

Time : 3 AM, 6 AM, 9 AM, 12 AM, 3 PM, 6 PM, 9 PM, 12 PM.

Temp : 98.8, 99.4, 100, 101, 102, 102, 100, 99.

(F)

(5) Represent the following religious composition of a town in a 'Bar' and a 'Pie Diagram' :

Hindus 45%  
 Muslims 40%  
 Sikhs 10%  
 Christians 5%

**4(A)2.8 : Correct Answers**

- (1) See unit 4(A)2.1.



- (2) See units 4(A)2.3, 4(A)2.4, and 4(A)2.5.
- (3) See units 4(A)2.2 to 4(A)2.5.
- (4) Refer to matter under the heading 'Changes' in unit 4(A)2.6.
- (5) Refer to 'Percentage Composition' in unit 4(A) 2.6.

#### **4(A)2.9 : Suggestions for Further Reading**

Garrett, H.E., "Statistics in Psychology and Education", Bombay : Vakils, Feffer and Simons (Pvt.) Ltd., 1971.

Guilford, J.P., "Fundamental Statistics in Psychology and Education", Tokyo : Mc-Graw Hill Kogakusha Ltd., 1978.



## MODULE 4(A) 3

### PERCENTILE

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#### 4(A) 3.0 : Specific Objectives of the Module

After reading this Module you are expected to be able to :

- (1) define a percentile.
- (2) tell the utility of percentiles.
- (3) compute any percentile by the graphical method.
- (4) compute any percentile by the computational method.
- (5) tell the meaning of 'Percentile Norm'.
- (6) tell the meaning of 'Percentile Rank'.
- (7) read the percentile rank of a score from percentile norms.

#### 4(A) 3.1 : Meaning and Utility of Percentiles

How do we usually judge the merit of a candidate for recruitment for a job or for admission to a higher course? As you know it is generally done by the score percentage of the candidates in the qualifying examination. But as the average score percentage varies with the standard of the examination, a high percentage in an easy examination may not show a better merit than a low percentage in a stiff one. Hence, if a candidate comes to us with a high percentage, we cannot be sure that he possess a high merit unless we are aware of the standard of the examination he



took. On the other hand the ranks of the candidates, first, second, third, etc. will not so much vary with the standard of the examination and may be a better indicator of merit. For example, if we have to choose three candidates for a job and there are six applicants with the following results in the graduate examinations of the different Universities in the same subjects—whom will it be better to select ?

Candidates :	A	B	C	D	E	F
Positions :	I	III	XX	XIX	XII	II
Score % :	65	63	70	68	69	67

I think, you will suggest that we should select candidates A, B, & F, inspite of their lower score percentages. Why ? It is for these reasons that it is better to know the rank positions of the candidates than their scores or score percentages. But when the number of the candidates passing an examination is very large, it is difficult to give rank positions to all of them, because there will be quite a large number of candidates getting the same score at almost all the score points. Moreover, if there is a big difference in the number of the candidates taking the same examination from different Universities the last rank in one may not be the last rank in the other, it may be much above that, e.g., if the number of candidates in one Univesity is 100 and in the other 200, 100 will be the last position in the first one and the middle position in the other one. They won't mean the same thing. Hence, in order to overcome these difficulties the Statisticians have evolved the 'percentile' scale. 'Percentiles' are points on the score scale below which the percentage of cases named by the Percentile lie; 10th Percentile,  $P_{10}$ , will be the score point below which 10% cases lie, similarly 20th Percentile,  $P_{20}$ , will be the score point below which the scores of 20% of the candidates will lie. Suppose 200 candidates took an Examination and it is calculated from their results according to methods explained below that  $P_{15}$  is at 18.4, scores of how many candidates will lie below 18.4 ? You will easily see that their number will be 30. When the Percentiles are computed at intervals of 10 they are called 'deciles'. The first decile is  $P_{10}$ , the second is  $P_{20}$  and so on. If percentiles of any results are calculated and enlisted, the percentile position or 'Percentile Rank' of any candidate, that is, what percentage of candidates is below him, can be easily found by taking his score and seeing from the list the Percentile position of the score. The Percentile list is known as 'Percentile Norm', and is an essential part of the Test Manual of all standradized 'objective tests'. You must have heard of objective tests of Intelligence, Achievement in different subjects, Personality Adjustment etc. when these tests are constructed, their final drafts are administered to a large sample of the population for which they are meant and the Percentile Norms of the results are determined. When

these tests are administered to anyone later on, his or her percentile position or rank in the population can easily be found out by consulting the Percentile Norm.

There are two methods of finding out the percentiles, one is Graphical and the other is Computational.

#### 4(A) 3.2 : Graphical Method of finding out Percentiles

First the Ogive of the scores, in terms of Percentages, is drawn after setting up a cumulative frequency percentage table as explained in the last Section on Graphical Representation of data. If need be you may look into the Section again. You know that the percentage scale is on the vertical or y-Axis and the scores are on the horizontal or x-Axis. Hence, for finding out any percentile, first a perpendicular is drawn on the y-Axis, parallel to the x-Axis, upto the Ogive, from the percentage point indicated by the percentile, e.g., for finding out the  $P_{70}$  score point, the perpendicular is drawn in the sketch below at the place where 70% lies on the y-Axis. Then at the place where this perpendicular cuts the Ogive line, a perpendicular is dropped on the x-Axis. The score point where it meets the x-Axis is the required Percentile. In the sketch below  $P_{70}$  is 60,  $P_{75}$  is 62, and  $P_{25}$  is 52.

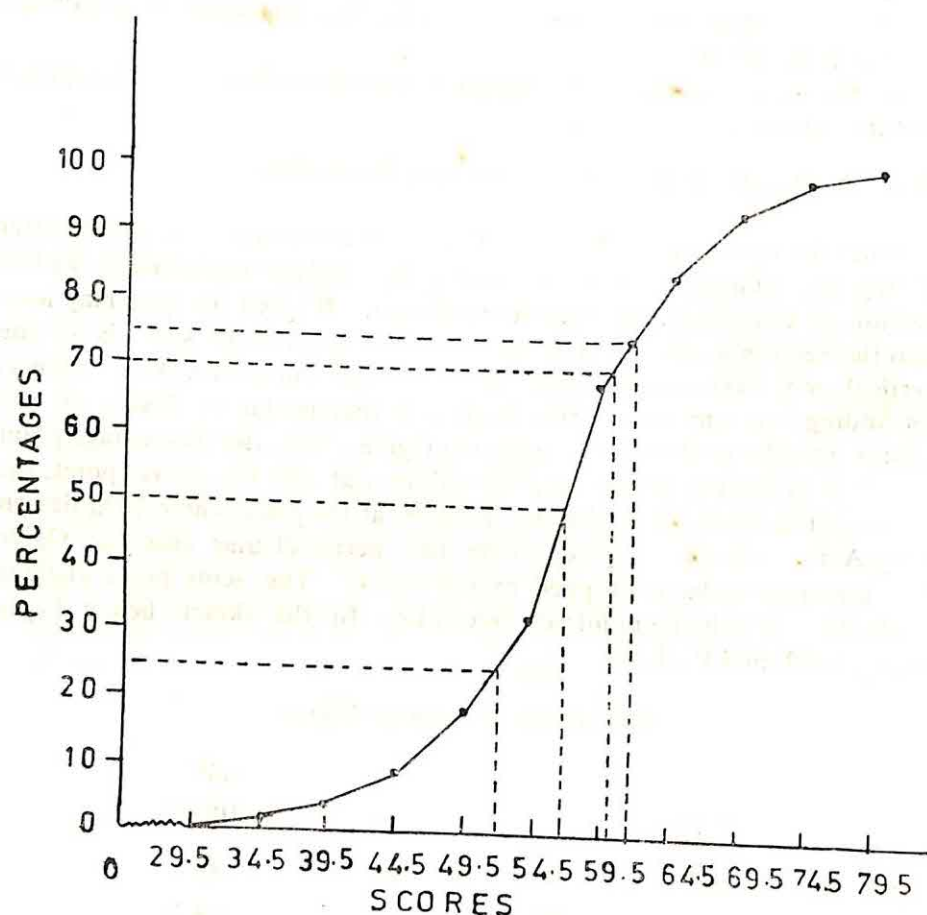
Cumulative Percentage Table

ci	f	cf	cP
75-79	1	85	100.0
70-74	4	84	98.8
65-69	8	80	94.1
60-64	15	72	84.8
55-59	30	57	67.1
50-54	12	27	31.8
45-49	8	15	17.7
40-44	4	7	8.3
35-39	2	3	3.5
30-34	1	1	1.2

$N=85$

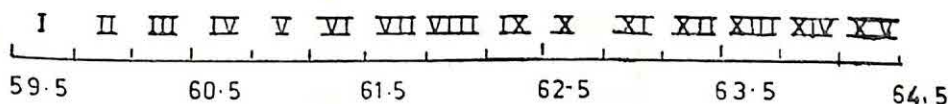


## THE OGIVE

**4(A) 3.3 : Computational Method of finding out Percentiles**

Suppose you have to find out the  $P_{70}$ . Then you will first of all have to find out what will be 70% of the  $N$ , which is 85 in the above example. It comes to 59.5. If we look into the cumulative frequency column of the example, we find that till the upper limit of the class-interval 55-59 the total frequency is 57, which is less than 59.5, but if we take one more class-interval above, 60-64, the total up to the end of this higher interval jumps to 72, much above 59.5, because there are 15 cases in this class-interval. How many out of 15 do we need to reach the figure of 59.5, which is 70% of 85. You will easily say that we need only 59.5-57, that is 2.5 cases (we don't mind cutting people into parts for mathematical accuracy). It means that we have to take only a small portion out of the

five units of the class-interval 60-64. But exactly how much ? This problem is solved by assuming that all the cases are not concentrated at the mid-point of the class-interval, as was assumed in drawing the frequency polygon, but are evenly spread all over the class-interval as was assumed in drawing the Histogram, and are occupying equal spaces as shown in the following sketch.



How many units of scores are there in this class-interval? Their number is 5. In the above sketch they have been shown as five unit intervals, with their exact limits. When there are 15 equally spread cases in these 5 intervals, how much space does each case occupy? Will it not be  $5/15$ , i.e.,  $1/3$ ? When 1 case occupies a space of  $1/3$  unit, how much space will 2.5 cases that we need from this class-interval take? You can easily see that they will occupy  $2.5 \times 1/3$  unit space, i.e., .83 unit space. Now if we go up .83 unit from 59.9, which is the exact upper limit of the class-interval 55-59 and exact lower limit of the interval 59-64, to which score point will we come? The Answer as you know will be  $59.5 + .83$  i.e. 60.33 or 60.3, if we want to be correct upto one decimal place only. Then, what is  $P_{70}$ ? (It came to 60 in the Graphical Method.)

Let us take another exercise. What will be  $P_{50}$  in the same distribution? We can now move quicker. What will be 50% of 85%? Ans : 42.5. In which class-interval will this total frequency of 42.5 lie? Ans : 55-59. As the total below this interval is only 27 and at the end of it goes to 57. How many cases are needed from this class-interval? Ans :  $42.5 - 27$ , i.e., 15.5. How many cases are there in this class-interval? Ans : 30. How much unit space does each case occupy in this class-interval of 5 units? Ans :  $5/30$  or  $1/6$ . Then how much space will 15.5 cases that we need from this interval occupy? Ans :  $1/6 \times 15.5$ , i.e., 2.6. At what score point will we reach if we proceed ahead 2.6 units from the exact lower end of the class-interval concerned? Ans :  $54.5 + 2.6 = 57.1$ . (In the Graphical Method  $P_{50}$  of this distribution came to 56.95.)

There is often some difference in the results of the two methods, but it is negligible.

#### 4 (A) 3.4 : Test Yourself

1. What is the meaning of  $P_{35}$ ?
2. What is the utility of Percentiles?



3. Calculate  $P_{25}$  and  $P_{75}$  of the following frequency distribution by (a) Graphical Method, and (b) Computational Method :

ci	f
110-114	2
105-109	5
100-104	8
95-99	10
90-94	20
85-89	30
80-84	22
75-79	8
70-74	7
65-69	5
60-64	3

4. What is the meaning of 'Percentile Rank' ?  
 5. What is meant by 'Percentile Norm'.  
 6. How will you read the Percentile Rank of a score from a Percentile Norm Table ?

#### 4 (A) 3.5 : Correct Answers

1. See Unit 4 (A) 3.1.
2. Ditto.
3. (a) Consult Unit 4 (A) 3.2.  
 (b)  $P_{25} = 81.1$  and  $P_{75} = 93.25$ .
4. See Unit 4 (A) 3.1.
5. Ditto.
6. Ditto.

#### 4 (A) 3.6 : Books Suggested for Further Reading

- Ferguson, G.A., "Statistical Analysis in Psychology and Education", New York : Mc-Graw Hill Book Co., 1971.  
 Garrett, H.E., "Statistics in Psychology and Education", Bombay : Vakils, Feffer and Simons (Pvt.) Ltd., 1971.  
 Guilford, J.P., "Fundamentals of Statistics in Psychology and Education", Tokyo : Mc-Graw Hill Kogakusha Ltd., 1978.  
 Thorndike, R.L., and Hagen, E., "Measurement and Evaluation in Psychology and Education", New York : John Wiley & Sons, Inc., 1969.



## MODULE 4(A) 4

### MEASURES OF CENTRAL TENDENCY

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#### 4(A) 4.0 : Specific Objectives of the Module

When you have read this Module you are expected to be able to :

- (1) tell the use of finding out a central tendency.
- (2) explain the meaning of the mean and calculate it by a short method, after grouping the scores.
- (3) define the 'Median' and compute it from ungrouped and grouped data.
- (4) tell the meaning of Mode and find it out in grouped and ungrouped measures.
- (5) decide the measure of central tendency appropriate for the given data and in different circumstances.

#### 4(A)4.1 : Purpose of Computing a Measure of Central Tendency

In the previous Modules we have seen the ways of summarizing the data. Now, we will see how the Statisticians try to condense the information conveyed by the data still further in order to get an overall idea of the quantity of the scores or the measurements in the shortest possible form by extracting what one may call their 'essence', in term of the 'Central Tendency'. This may remind you of the Central Idea in



descriptive essays. The Central Tendency of the data is assessed in three different ways by computing the Mean, the Median and the Mode.

#### 4(A)4.2 : The Meaning and the Computation of the Mean

This is also called the average, and you are so familiar with it. It is obtained by dividing the sum of the scores or the measurements by their number, e.g., there are 5 scores 25, 30, 40, 20, and 15. Their sum is 130, which when divided by 5, their number, gives the Mean 26. Since the Mean is the result of equal distribution of the joint stock, it may be called 'Mathematical Socialism'. The simple process on adding and dividing to get the Mean is not at all difficult to carry out if the number of the scores,  $N$  is not large, or a calculating machine or a computer is available to cope with large  $N$ 's. But otherwise, we will have to use some short method to calculate the Mean by hand, manual calculation, if the  $N$  is large. The following method is adopted for that.

The data are first classified and tabulated in a frequency distribution Table and as referred to earlier, in connection with the Frequency Polygon, an assumption is made that the scores in a class-interval are not of different values, but all of them, whatever their number, have the value of the mid-point of the interval in which they are, e.g., the frequency of the class-interval 15-19 may be 5, and these 5 scores may be 15, 16, 18, 17, and 16, but these will all be supposed to have the same value of the mid-point of the class-interval, i.e., 17. If we calculate the average of the actual values, it comes to 16.4, which is fairly close to 17. It so happens because if some scores are of higher value than the mid-point, some are of lower value and there is some neutralization of the errors. Moreover, the small shortage in one class-interval may be made up by a little excess in the other. The overall effect of the neutralization process is that the difference between the Means calculated from the ungrouped and the grouped data is negligible.

After the frequency distribution table is set up or supplied ready-made to us, the following steps are taken. An Example is being taken to explain the steps.

ci	f	$x'$	$fx'$	
55—59	1	6	6	
50—54	2	5	10	
45—49	3	4	12	
40—44	5	3	15	
35—39	8	2	16	
30—34	12	1	12	71
25—29	20	0	0	

20—24	14	—1	—14	
15—19	9	—2	—18	
10—14	6	—3	—18	
5—9	3	—4	—12	
0—4	1	—5	—5	—67
	———		———	
	N 84		$\Sigma$ 4	

*Step I :* Though the Mean is not known, a Mean is Assumed at the centre of any of the class-intervals, preferably at the centre of the interval near about the middle of the distribution and with the largest frequency, in order to facilitate further computations. In the above example, the Mean is Assumed to be at the centre of the class-interval 25-29, that is, at 27.

*Step II :* In the third column, under the heading  $x'$ , the class-interval with the assumed Mean is given the value of 0, the intervals above it are given values of 1, 2, 3, etc., as we go up, while the class-intervals below the 0 interval, are given values of —1, —2, —3, etc., as we go downwards.

*Step III :* In the fourth column, under the head,  $fx'$ , the values of the products of 'f' and  $x'$  figures are put down, and totalled. The sum has the symbol,  $\Sigma$ . In order to prevent error, the positive figures above 0 are added and their sum is put to the right of the last positive figure. In the above example it is 71. Similarly the negative figures below the 0 are added and their sum is recorded, with a negative sign, to the right of the last negative figure. In the example we are dealing with, its value is —67. After that we see which figure is higher, and subtract the lower figure from the higher one, and put the sign of the latter before the remainder. In this example it is +4. When it is plus we may or may not put the algebraic sign, as no sign means a positive sign.

*Step IV :* The sum of the  $x'$  column is divided by the total number of the frequencies, N, and the value thus obtained (quotient) is the correction for the Assumed Mean, in terms of the class-intervals, but when it is multiplied by the size of the class-intervals, it gives the correction in terms of the score or measurement units. In the example in hand, the sum of the  $fx'$  column is 4, and when it is divided by 84, the correction, in terms of class-intervals, comes to be  $4/84$  or  $1/21$  or .048. When it is multiplied by the size of the class-interval, which is 5 in this example, it gives the 'correction' in terms of the scores. It comes to be  $.048 \times 5 = .24$ , since it is positive it is added to the Assumed Mean (A.M.) in order to get the Mean. Hence, the Mean in this example comes out to be  $27 + .24 = 27.24$ . When the correction term in the units of scores



comes out to be negative, as it does when the sum of  $fx'$  is negative, it is subtracted from the A.M.

#### 4(A) 4.3 : The Meaning and the Computation of the Median

It is simply the  $P_{50}$  of a set of scores or Measurements, and you have already learnt to calculate it, in the last Module, both by the Graphical and the Computational Method. How will you now define the Median? You may fill in the blanks in the following statement to do that.

'The Median is a point on the measuring scale above and below which 50% of the scores lie.'

How will you find the median of the data that have not been grouped in a frequency distribution table? For that the following Steps have to be taken.

*Step I:* The scores are arranged in a descending or ascending order, as in the following example :

15, 17, 18, 20, 22, 25, 27 (ascending order)

*Step II:* If the number of the scores is odd, the middle score is the median, e.g. '20' in the above example, since half the scores are above it and half are below it. But if the number of the scores is even, as in the following example the mid-way distance between the two figures in the centre is the median :

15, 17, 18, 22, 25, and 27

The median in this example will be the mid-point between 18 and 22, which can be found by adding these two and dividing the sum by 2.  $18+22=40$ , and  $40/2=20$ . Hence, 20 is the Median.

#### 4(A) 4.4 : The Meaning and the Computation of the Mode

In language 'Mode' means the usual style or fashion, that is, the style or fashion of most of the people. In measurement 'Mode' is the score or the measurement that occurs the most, e.g., if the score of 10 students in an examination are 20, 22, 25, 22, 24, 29, 22, 28, 30 and 32, then 22 is the Mode. If the information regarding the scores or measurements is only in the form of a frequency distribution table instead of individual scores, then the Mode is said to be at the centre of the class-interval with the highest frequency and as it is a rough estimate it is said to be the 'crude mode', e.g., in the frequency distribution table taken for calculating the Mean, the crude mode is at 27, which is the mid-point of the class-interval 25-29 that has the highest frequency. In case two consecutive class-intervals have the same largest frequency, then the crude mode is the exact point of separation between these two class-intervals, e.g., if two class-intervals 20-24 and 25-29 have each a frequency of 34, which is

the largest frequency, then the mode is 24.5 which separates the two class-intervals.

#### 4(A) 4.5 : When to Use the Different Measures of Central Tendency

After having learnt about the three measures of the central tendency, viz., the Mean, the Median, and the Mode, let us see which measure suits which circumstance the most.

1. *The Mean* : (i) It is the most suited when the scores are almost equally balanced on the two sides of a central point.

(ii) When the most stable measure of the central tendency is required, that is, the measure which would change (fluctuate) the least from sample to sample of the same population.

(iii) When other statistics, like the Standard Deviation (see next Section), based on the Mean is to be calculated.

2. *The Median* : (i) It is better to calculate the Median when there are extreme scores, since they would affect the Mean unduly but not the Median. By extreme scores, we mean the scores that are far removed from the other scores, e.g., in the following example 97 is an extreme score :

20, 22, 25, 26, 27, and 97.

Now 97 would unduly affect the mean, since the mean would be raised quite high due to one score only and give the wrong impression that all the scores are fairly good. The Mean of the scores with 97 is 36.17, while without it is 24 only. It is like the per capita income of a population appearing to be quite satisfactory on account of a few multimillionaire families in it, though the general mass of people may be grinding in poverty. On the other hand the Median is not affected by the extreme scores, e.g., in the above set of scores the Median will be 25.5, whether the highest score is 28 or 97. Hence, in these circumstances the Median gives a more appropriate measure of the central tendency.

(ii) When the information in a frequency distribution table is truncated at either or both the ends, and the first and the last class-interval or both have unknown limits, as shown in the following example, it is not possible to calculate the mean. In such circumstances the Median can be easily computed

ci	f
120 or more	8
115—119	10
110—114	12
105—109	20
100—104	35



95—99	56
90—94	75
85—89	65
80—84	39
75—79	30
70—74	25
65—69	15
64 or less	10

(iii) When the Quartile Deviation is going to be the measure of Dispersion (see next Module).

3. *The Mode* : (i) When a quick and an approximate measure of the central tendency will be enough.

(ii) When the purpose to know is the popular style or fashion as in sale researches.

#### 4(A) 4.6 : Test Yourself

Compute the Mean, the Median, and the crude Mode in the following distributions.

(a) ci : 5—9, 10—14, 15—19, 20—24, 25—29, 30—34, 35—39, 40—44.

f : 1, 4, 7, 15, 10, 7, 3, 2.

(b) ci : 10—19, 20—29, 30—39, 40—49, 50—59, 60—69, 70—79, 80—89, 90—99.

f : 2, 8, 15, 20, 25, 18, 10, 6, 2.

2. In a speed test the number of candidates who completed a given task in different number of minutes is given in a frequency distribution table below. Calculate the appropriate measures of central tendency.

No. of minutes : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, more than 10.

f : 1, 2, 2, 3, 15, 11, 10, 5, 4, 3, 4.

*Note* : Please note that the class-interval here is of one unit only.

3. Out of the Mean and the Median, which is a better measure of the central tendency in each of the following three sets of scores and why ?

(a) 15, 16, 17, 19, 25, 14, 13 and 77.

(b) 12, 14, 17, 11, 10, 15, 18, 19, 20.

(c) 45, 47, 45, 45, 46, 45, 48, 45, 99, 95, 55.

4. What is the use of finding out a central tendency ?

#### 4(A) 4.7 : Correct Answers

1. (a) Mean = 24.3, Median = 23.66, Crude Mode = 22.

(b) Mean = 56.2, Median = 52.7, Crude Mode = 54.5.

2. The Median is the most appropriate measure, since the Crude Mode is only a crude measure and is not of much importance to statisticians, and

the Mean cannot be calculated since the upper limit of the last class-interval is not known.

The value of the Median is 6.14.

3. (a) Because of the extreme score 77, the Median will be a better measure. cf. 4(A)4.5.
- (b) As the scores are almost equally balanced around 15 and there are no extreme scores, the Mean will be a better measure. cf. 4(A) 4.5.
- (c) The median will be a better measure because of the extreme scores of 99. cf. 4(A) 4.5.

#### 4(A) 4.8 : Books Suggested for Further Reading

Ferguson, G.A., "Statistical Analysis in Psychology and Education", New York : Mc-Graw Hill Book 1971.

Garrett, H.E., "Statistics in Psychology and Education", Bombay : Vakils, Feffer and Simons (Pvt.) Ltd. 1971.

Guilford, J.P., "Fundamental Statistics in Psychology and Education", Tokyo : Mc-Graw Hill Kogakusha Ltd., 1978.

Walker, Helen, "Elementary Statistical Methods", New York : Henry Holt, 1943.





## MODULE 4 (A). 5

### DISPERSION

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#### 4 (A) 5.0 : Specific Objectives of the Module

When you have read this Module, it is expected that you will be able to :

- (i) explain the significance of the measures of dispersion.
- (ii) tell the meaning of range and compute it.
- (iii) tell the meaning of Average Deviation and compute it.
- (iv) tell the meaning of Quartile Deviation and compute it.
- (v) tell the meaning of Standard Deviation and compute it both from ungrouped and grouped data.
- (vi) Decide the measure of dispersion appropriate for the given data and in different circumstances.

#### 4 (A) 5.1 : Significance of Measures of Dispersion

The measures of the central tendency do not tell the complete story. Two samples with the same central tendency may be widely different, e.g., a locality with an average per capita (per head) income of Rs. 400 per month may mostly have adults with an income of about Rs. 400 per month, while another locality with the same average may have a few multimillionaries and a number of paupers. Similarly, the average score

of two Sections of a Class may be 50 each, but in one the score of most of the students may be between 40 and 60, while in the other a few may have scored more than 90, while the rest may have obtained less than 20. Thus though the averages are the same, the pictures of the attainments in the two Sections are much different. The same sort of thing may happen with the other measures of the central tendency too. The median scores in two classes may be the same, say 50, but in one the range of the scores may be from 40 to 60 only, while in the other it may extend from 15 to 90, with a lot of gaps. Similarly the modes in two sets of scores may be the same but the other scores may be widely different. Hence, in order to compare measurements of two or more groups what more should be look to besides the central tendency? We should find out the extent to which the measurements or the scores are close together or apart. This is called, 'scatter', 'spread', 'variability', 'deviation' or 'dispersion' of the scores or measurements, and there are four measures of it.

#### 4 (A) 5.2 : Range

As you already know it, you may easily complete the following sentence to get its definition :

Range is the distance or interval between the highest and the lowest scores or measurements.

Find out and compare the ranges of the following two sets of measurement :

I Set : 15, 16, 17, 18, 20, 22, 98. (range  $98 - 15 = 83$ )

II Set : 15, 17, 17, 19, 19, 20, 22. (range  $22 - 15 = 7$ )

Do you see anything wrong in this measure of dispersion? Though the range of the I Set appears to be much larger than that of the II Set, yet the difference has come about only due to the shooting away, rather far away, of a solitary measure, from the main set in the first case otherwise, the ranges of the two sets are the same.

#### 4 (A) 5.3 : The Average or Mean Deviation, A.D. or M.D.

This is found out by taking the average of the distances (deviations) of each of the scores from the Mean, without considering their algebraic signs and treating all of them as 'positive', irrespective of the fact whether they are on the lower or the higher side. In short, we may say that it is the average of the 'absolute' differences of the scores from the Mean.

Find out the A.D. of the following set of scores :

10, 15, 20, 25 & 30.

1 Step : Find out the Mean. It is 20.



II Step : Find out the sum of the absolute deviations of the scores from the Mean :

$$10-20=10, 15-20=5, 20-20=0, 25-20=5, 30-20=10.$$

Hence,  $10+5+0+5+10=30$

III Step : Find out the average of the absolute differences, which is the A.D.  $30/5=6$

If each score is taken as X and the Mean is taken as M, the equation for computing the A.D. may be written as follows :

$$\text{A.D.} = \frac{\sum (X \sim M)}{N}$$

$\sim$  indicates absolute difference, and as you already know  $\Sigma$  means the SUM.

As A.D. is rarely used in modern Statistics, you needn't bother about computing it in grouped data.

#### 4 (A) 5.4 : The Quartile Deviation or Q

The percentile range can be broken into four quarters (Quartiles). What percentile will there be at the end of the first Quartile,  $Q_1$ ? I hope you will have no difficulty in saying,  $P_{25}$ . Now fill in the blanks in the following statement :

'At the end of the first Quartile,  $Q_1$ , we will have  $P_{25}$ , at the end of the second Quartile,  $Q_2$ , there will be  $P_{50}$ , at the end of the third Quartile  $P_{75}$ , and end of the fourth Quartile,  $Q_4$   $P_{100}$ .'

The Quartile Deviation (Q) is half the distance between  $Q_1$  and  $Q_3$ . Hence, the equation for the Q is :

$$Q = \frac{Q_3 - Q_1}{2}$$

Therefore, at the distance between  $Q_1$  and  $Q_3$ , which marks the middle 50% of the cases is called the inter-quartile range, the Q is also known as the 'Semi-Interquartile-range.' Truly speaking Q is the average of the distances of  $Q_1$  and  $Q_3$  from  $Q_2$ , the Median.

$$\frac{(Q_3 - Q_2) + (Q_2 - Q_1)}{2} = \frac{Q_3 - Q_1}{2}$$

If the distribution is symmetrical on the two sides of the Median, the distances  $Q_3 - Q_2$  and  $Q_2 - Q_1$  will be equal, but if the distribution is not so the two distances will not be equal. In the former case, averaging need not be done as any of the two distances would give the value of Q, but in the latter case the two distances will have to be added and their average taken. As averaging takes care of both the situations, so we apply the formula  $\frac{Q_3 - Q_1}{2}$ , which amounts to averaging, in all the situations. As Garrett says, "Since Q measures the average distance of the quartile

points from the median, it is a good index of score density at the middle of the distribution. If the scores in the distribution are packed closely together the quartiles will be near one another and  $Q$  will be small. If scores are widely scattered, the quartiles will be relatively apart and  $Q$  will be large."<sup>1</sup>

As you have already learnt in Module 4 (A)3 how to compute the Percentiles, you should have no difficulty in computing  $Q_1$  and  $Q_3$  and the  $Q$  (Quartile Deviation).

#### 4 (A) 5.5 : The Standard Deviation (S.D. or $\delta$ )

The average of the squares of the deviations of the scores from the Mean is called the 'Variance', and the square root of the 'Variance' is the 'Standard Deviation'. Hence, for finding out the S.D. the following steps will be taken. They have been explained with the help of a specific example.

Find out the S.D. of : 10, 15, 20, 25 & 30.

I Step : Find out the Mean. It is 20 in the above example.

II Step : Square the deviations of each score from the Mean and add them up.

In the above example :  $(10-20)^2 + (15-20)^2 + (20-20)^2 + (25-20)^2 + (30-20)^2$

$$= 100 + 25 + 0 + 25 + 100 = 250$$

III Step : Divide the sum of the squares of the deviations by the number of the scores to get the 'Variance' e.g.  $250/5 = 50$  (Variance).

IV Step : Find out the square root of the Variance to get the Standard Deviation, e.g.,  $\sqrt{50} = 7.071$ .

Now if we write the equation for the S.D. it will be :

$$\text{S.D. or } \delta = \sqrt{\frac{\sum (X-M)^2}{N}}$$

You may define the 'Standard Deviation' in words by filling in the blanks in the following statement :

'Standard Deviation is the.....of the average of the.....deviations of the scores from the Mean'.

If the number of the scores is large, we cannot cope with them by using the above method without the help of a calculating machine or a computer. In case this help is not available, we will have to use a short method for finding out the S.D. by grouping the data in a frequency distribution table.

**Frequency distribution Method :** For this method, as stated just now, the data have to be classified in a frequency distribution table, and then

1. Garrett, H.E., "Statistics in Psychology and Education", Bombay : Vakils, Feffer and Simons (Pvt.) Ltd., 1971, p. 47.



all the columns described earlier for finding out the Mean by the Short Method are filled in [cf. Sec. 4(IV) 4]. After that, one more column,  $fx^2$  is added. In this column the products of the pairs of figures in  $x'$  and  $fx'$  columns are filled in, as you will see in the example given below. The sum of the figures in this new column is also found out and written.

When all the above data are available, the required values are filled in, in the following equation :

$$\text{S.D. or } \delta = i \sqrt{\frac{\sum fx'^2}{N} - \left(\frac{\sum fx'}{N}\right)^2}$$

'i' is the size of the class-intervals. You are familiar with the rest of the symbols.

Example : Calculate the S.D. of the scores in the following distribution table. (The table is the same as the one taken earlier for finding out the Mean by the Short Method.)

ci	f	$x'$	$fx'$	$fx'^2$
55—59	1	6	6	36
50—54	2	5	10	50
45—49	3	4	12	48
40—44	5	3	15	45
35—39	8	2	16	32
30—34	12	1	12	12
25—29	20	0	0	0
20—24	14	-1	-14	14
15—19	9	-2	-18	36
10—14	6	-3	-18	54
5—9	3	-4	-12	48
0—4	1	-5	-5	25
	<hr/> N 84		<hr/> -4	<hr/> 400

$$\text{Hence } \delta = 5 \sqrt{\frac{400}{84} - \left(\frac{4}{84}\right)^2} \text{ (cf. the equation given above).}$$

$$= 5 \sqrt{\frac{100}{21} - \left(\frac{1}{21}\right)^2}$$

$$= 5 \sqrt{4.8 - (.048)^2}$$

$$= 5 \sqrt{4.8 - .0023}$$

$$= 5 \sqrt{4.798}$$

$$= 5 \times 2.19 = 10.95$$

#### 4 (A) 5.6 : When to Use the different Measures of Dispersion

Now let us discuss the different circumstances in which each of these should be preferred as a measure of dispersion.

1. *Range* : This may be used only when we are in a hurry to get a rough estimate of dispersion, and that too only when there are no extreme scores, that is, score that shoot far away from the main body of the scores.

2. *Average or Mean Deviation* : It may be used when there are extreme scores that will unduly affect the size of the Standard Deviation. But, as stated earlier too, this index is rarely used in modern statistics.

3. *Quartile Deviation* : (i) When the measure of the central tendency used is the Median.

(ii) When one is interested only in the concentration of the middle 50% cases.

(iii) When the extreme scores are likely to influence the S.D. unduly, then it is better than the A.D. even, because this measure does not take into account the end scores at all.

(iv) When the frequency distribution table is available in a truncated form only, that is, the size of the top or bottom or of both the class-intervals is not known, which is necessary for computing the S.D., but not for the Q, unless  $Q_1$  or  $Q_3$  lies in one of the truncated intervals.

4. *Standard Deviation* : (i) When there are no extreme scores.

(ii) There is no truncation in frequency distribution information.

(iii) When the Mean is the measure of the central tendency.

(iv) When the most stable measure of dispersion is needed, that is, a measure which would fluctuate the least from sample to sample in the same population.

(v) When some other statistics based on the Standard Deviation is to be computed, like the product-moment correlation,  $r$ . As a matter of fact, this is the most used measure of dispersion in modern Statistics.

#### 4 (A) 5.7 : Test Yourself

(1) Calculate the Quartile Deviation and the S.D. of the scores in the frequency distribution table given below :

ci :	10—19	20—29	30—39	40—49	50—59	60—69	70—79	80—89
f :	2	5	8	15	10	6	5	1

(2) What measure of dispersion will suit the data given below ?

Calculate the same.

ci :	Below 10	10—14	15—19	20—24	25—29	30—34	35—39	40—44
f :	6	7	9	10	25	10	7	2

(3) If in a sample of 50 candidates the Standard Deviation of the scores is 8, what will be the sum of the squares of the deviation of the scores from the Mean ?

(4) If in an examination the S.D. of the scores is 10, and the sum of



the squares of the deviations of the scores from the Mean is 1,000, what was the number of the candidates ?

(5) In an examination the  $Q_3$  of the scores of the girls is 67, while  $Q_3$  of the scores of the boys is 70. As regards  $Q_1$ , it is 45 in the case of girls and 40 in case of boys. Candidates of same sex are closer together ?

(5) Find out the Variance of the following scores, and then their Standard Deviation :

15, 40, 25, 30 & 10

#### 4 (A) 5.8 : Correct Answers

(1)  $Q=10.75$ ,  $S.D.=16.1$

(2) The Quartile Deviation will suit. The Standard Deviation cannot be calculated as the lower limit of the lower most class interval is not given. The value of  $Q$  comes to 5.8.

(3) 3,200.

(4) 10.

(5) The girls are closer together, since the  $Q$  in their case is 11, while it is 15 in the case of the boys.

(6)  $V=114$ ,  $S.D.=10.677$

#### 4 (A) 5.9 : Suggestions for Further Reading

Ferguson, G.A., "Statistical Analysis in Psychology and Education", New York : Mc-Graw Hill Book Co., 1971.

Garrett, H.E., "Statistics in Psychology and Education", Bombay : Vakils, Feffer, Simons (Pvt.) Ltd., 1971.

Guilford, J.P., "Fundamental Statistics in Psychology and Education", Tokyo : Mc-Graw Hill Kogakusha Ltd., 1978.

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Wilks, S.S., "Elementary Statistical Analysis", Princeton : University Press, 1949.

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## MODULE 4(A)6

### CORRELATION (RANK DIFFERENCE METHOD)

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#### 4(A)6.0 : Specific Objectives of the Module

It is expected that after you have read this module you will be able to :

- (a) tell what correlation in statistics means.
- (b) tell the meaning of the term 'correlation coefficient'.
- (c) calculate the 'correlation coefficient' by rank difference method.
- (d) tell the different kinds of educational investigations in which correlation has to be found out.

#### 4(A)6.1 : Meaning of Correlation

So far we have considered the measures that give an idea of the general size and distribution of the scores on a single variable in a single sample. But in this Module we shall study a method of finding out the relationship between two variables in a single sample or between two samples of two different populations on a single variable. A variable is any quality or trait that varies and is not the same in all the members of a population, like height, weight, intelligence, achievement in a school or college subject etc., while a sample as you know is a small portion of the population, which is supposed to represent the entire population.



What will happen when there is a positive relationship between height and weight in a sample? Answer this question by filling in the blanks in the following sentence :

When there is a positive relationship or 'correlation' between height and weight the measures of one of them.....as the measures of the other increase, and they .....as the measures of the other decrease.

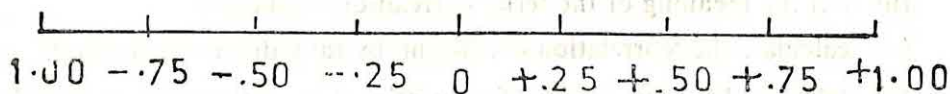
Now you can yourself frame a sentence to describe what will happen if there is a negative correlation between any two variables, say per head income (per capita income) and death (mortality) rate.

When there is no relationship between any two variables, like weight and Intelligence the 'correlation' is said to be zero.

In the above examples we have considered the correlations between two variables in a single sample of a particular population. But as said at the very beginning there may be a relationship between two samples of two different populations on a single variable, e.g., between Intelligence of sons and fathers (positive). It has to be remembered that for finding out such 'correlations' by the Rank Difference Method, the members of the two samples must be capable of being put in pairs on some basis or the other, like, sons and fathers, brothers and sisters, teacher and student etc.

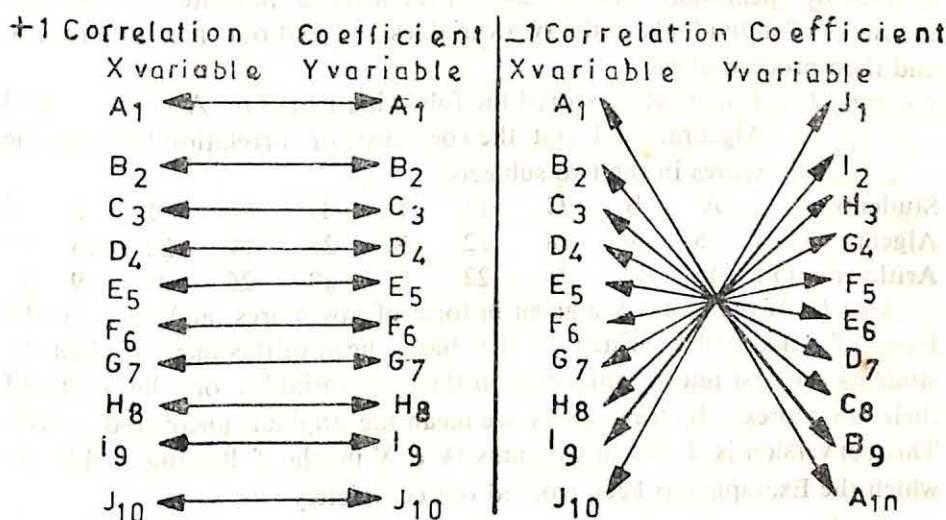
#### 4(A)6.2 : The Correlation Coefficient

For measuring the direction and the amount of correlation, the statisticians have evolved a scale of 'coefficient of correlation', the range of which is from  $-1$  to  $+1$  with the 0 in the middle, as shown below :



The correlation coefficient is  $+1$  only when the ranks of the members of a sample are exactly the same in both the variables, e.g. if one who is the tallest is also the heaviest, and one who is second in height is also the second in weight, and the third in height is the third in weight, and so on, the correlation coefficient between height and weight will come to be  $+1$ . Similarly, if the rank of a son in the sample of sons is the same as of his father in the sample of fathers, in intelligence, the correlation coefficient between fathers and sons, as regards intelligence, will be  $+1$ . On the other hand the correlation coefficient is  $-1$ , when the rank of a member of a sample is as low in one variable as it is high in the other one, e.g., if a student stands first in Mathematics but last in English, another one who stands second in Mathematics is last but one in English, and so on, that is,

the ranks of the students in Mathematics in the descending order (from above) are the same as their ranks in the ascending order (from below) in English. These facts have been illustrated in the following two sketches by arranging ten students, A-J, in their rank orders in two variables and joining them by straight lines. When the correlation



coefficient is  $+1$ , all the lines are parallel, but when it is  $-1$ , all of them cross at one point.

$+1$  correlation coefficient

But  $+1$  or  $-1$  correlation coefficient is hardly ever found with actual data, generally the correlation is between these two extremes, and is computed up to two decimal places. The nearer the coefficient is to  $+1$  the larger will be the number of the lines that will run parallel to one another if a sketch like the above one is drawn, and the nearer the coefficient will be to  $-1$ , the greater will be the number of the lines that will cut one another at one point when the coefficient is zero the arrangement of the lines is altogether haphazard. Fill in the blanks in the following sentences :

- The nearer the correlation coefficient is to  $+1$ , the..... or is the tendency of the ranks of the individuals, in the two variables, to remain the same.
- The nearer the correlation coefficient is to  $-1$ , the ..... or is the tendency of the rank of an individual to fall in one variable as it rises in the other.
- When the rank of an individual in one variable has nothing to do with his rank in the other variable, the coefficient of correlation between the two variables is .....



#### 4(A)6.3 : Computation of Spearman's Correlation Coefficient

Now, we will study a method of computing the coefficient of correlation, out of a number of Methods that are there. The Method that we are going to take up, is called the 'Rank Difference Method' and was evolved by Spearman. As the name of the method indicates we first take the ranks of individuals in the two variables and find out their differences, and then proceed ahead.

*Example I* : Ten students scored the following marks in Arithmetic and Algebra, find out the coefficient of correlation between the scores in the two subjects.

Students	: A	B	C	D	E	F	G	H	I	J
Algebra (X)	: 35	40	18	12	30	25	24	22	25	13
Arithmetic (Y)	: 45	40	20	22	13	28	26	20	29	15

*Step I* : If the scores are given in form of raw scores and not in the form of rank order, which is the basic need of this method, then the students are first put in rank order in the two variables on the basis of their raw scores. By 'raw scores' we mean the original uncovered scores. This conversion is shown in Columns IV & V in the following Table, in which the Example has been worked out completely :

I	II	III	IV	V	VI	VII
Students	Marks in X	Marks in Y	Rank in X	Rank in Y	Diff. (Abs) between IV & V (Ranks)	Square of VI, i.e., of diff. bet- ween Ranks
A	35	45	2.0	1.0	1	1.00
B	40	40	1.0	2.0	1	1.00
C	18	20	8.0	7.5	.5	0.25
D	12	22	10.0	6.0	4	16.00
E	30	13	3.0	10.0	7	49.00
F	25	28	4.5	4.0	.5	0.25
G	24	26	6.0	5.0	1	1.00
H	22	20	7.0	7.5	.5	0.25
I	25	29	4.5	3.0	1.5	2.25
J	13	15	9.0	9.3	0	0.00
Sum ( $\Sigma$ )						72.00

*Note* : The difference in column VII, between the Ranks, are absolute differences, i.e., without the algebraic signs, and hence positive.

$$\rho = 1 - \frac{6 \times \Sigma D^2}{N(N^2 - 1)}$$

$$\therefore 1 - \frac{6 \times 71}{10(100-1)} = 1 - \frac{426}{990} = .57$$

It will be seen that in doing the ranking for columns IV & V there are ties for the same rank when scores of two or more candidates are the same. For example, two students have the same score, 25, in column II, and 25 comes at the 4th rank. Should both the students, F and I, be given the same rank of 4 or one be given the rank of 4 and the other of 5, but in that case it will be difficult to decide as to who should be called 4th and who 5th. Hence, both the ranks 4th and 5th are averaged and the average 4.5 is assigned to both. The next score of 24 of G is given the rank of 6. (cf. column IV). Similarly, in column III, two students, C and H, have the same score of 20 which falls at the 7th position, hence, one of them should get the 7th and the other the 8th rank. In these circumstances the two ranks 7th and 8th have been averaged and the rank of 7.5 has been assigned to both C and H. The next score of 15 obtained by J has been given the rank of 9 (cf. column V). If there are three candidates who get the same score, three ranks have to be averaged and assigned to all the three, as you will see in the next example.

*Step II* : After the ranks have been assigned in columns IV and V, their absolute differences, pair-wise, are recorded in column VI. No heed need be paid to minus or plus sign, since these differences are to be squared in column VII and get the positive value.

*Step III* : The absolute differences of column VI are squared and recorded in column VII. The sum of these is taken for substitution in the formula for finding out the Spearman's correlation (rank-difference method correlation), which is usually symbolized as  $\rho(\text{rho})$ .

*Step IV* : The values required for the formula for computing the rank-difference method correlation are substituted, as in the above table. In this example the correlation coefficient comes to .56, which is a medium sort of correlation.

*Example II* : The scores of fathers and sons in a variable is as follows. Find out the correlation between the scores of the fathers and the sons, with respect to that variable.

Fathers :	50	75	80	50	50	40	45	60	35	55
Sons :	80	35	40	65	55	80	60	45	75	55

The computations are made in the following table according to the steps explained in Example I.



I Serial No. of Pair	II Father (F)	III Son (S)	IV Rank (F)	V Rank (S)	VI Diff. (Abs) R(F) and R(S)	VII Square of Diff.
1.	50	80	6	1.5	4.5	20.25
2.	75	35	2	10.0	8.0	64.00
3.	80	40	1	9.0	8.0	64.00
4.	50	65	6	4.0	2.0	4.00
5.	50	55	6	6.5	0.5	0.25
6.	40	80	9	1.5	7.5	56.25
7.	45	60	8	5.0	3.0	9.00
8.	60	45	3	8.0	5.0	25.00
9.	35	75	10	3.0	7.0	49.00
10.	55	55	4	6.5	2.5	6.25

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Σ 298.00

$$\rho = 1 - \frac{6 \times 298}{990} = 1 - \frac{1788}{990} = 1 - 1.81 = -.81$$

*Step I :* You will see that in the ranking of the fathers in column IV, three persons have got a score of 50 which comes after the 4th rank. As these three should occupy the 5th, 6th, and the 7th ranks, they all have been given the average of these three ranks, which comes to 6 :  $\frac{5+6+7}{3} = 6$ . The father getting the score of 45 after 50 has been given the rank of 8.

In the ranking of the sons in column V, you will find that two of them get the score of 55 just after the 5th rank. Hence 6th and 7th ranks have been averaged as 6.5 and given to both the sons getting 55. The son whose score, 45, comes after 55 has been given the rank of 8.

*Step II :* The absolute differences between the ranks of the fathers and the sons are recorded in column VI.

*Step III :* The squares of the absolute differences in column VI are recorded in column VII. Their sum comes to 298.00.

*Step IV :* After substituting the actual values in the formula for computing the correlation by the rank difference method, the value of  $\rho$  comes to  $-.81$ , which means that there is a strongly negative correlation.

Now, why do we need to compute correlation coefficients in education ?

**4(A)6.4 : Utility of Correlations in Educational Investigations**

Many investigations in Education are based on correlations since they answer questions like the following :

(1) What relationship is there between a knowledge of Grammar and the proficiency in writing a composition ?

(2) What is the relationship between academic attainments and success as a school teacher.

(3) What relationship is there between the High School results of the students and the socio-economic status of their families ?

(4) What should be the criteria for the selection of the students for the Teacher Training or M.B.B.S. course ?

For this, we first hunt out the qualities or attributes that are highly and positively correlated with success in these courses.

(5) What are the fundamental, i.e. primary/basic dimensions (common factors) in Intelligence or Creativity or some other field ?

For this, the attainment in the field under study is measured on a number of tests and the scores in the different tests are correlated and analysed to get the factors that are common in them. This procedure is known as 'Factor Analysis'.

**4(A)6.5 : Test Yourself**

(1) Find out the correlation between the scores of the following twelve students in English and Arithmetic. The scores in English are in the first line and in Arithmetic in the second one.

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
9	15	20	35	25	37	40	20	28	27	22	26
8	25	19	25	28	22	27	27	35	36	30	24

(2) Find out the correlation between the heights of the mothers and daughters given below, in inches. The measurements of the mothers are in the first row and of the daughters in the second row. There are twelve pairs of mothers and daughters.

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
50	55	57	52	55	60	62	52	66	64	67	54
51	56	55	53	60	60	64	50	64	62	65	53

(3) What does a positive sign or no sign before a correlation coefficient indicate, and what does a negative sign show ? What does a zero correlation mean ?

**4(A)6.6 : Correct Answers**

(1) .31

(2) .94



(3) See Unit 4(A)6.2

#### 4(A)6.7 : Suggestions for Further Reading

1. Garrett, H.E., "Statistics in Psychology and Education", Bombay : Vakils, Feffer & Simons Pvt. Ltd., 1971.
2. Guilford, J.P., "Fundamental Statistics in Psychology and Education", Tokyo : Kogakusha Co. Ltd., 1965.
3. McNemar, Q., "Psychological Statistics", New York : John Wiley & Sons, 1962.
4. Tate, M.W., "Statistics in Education", New York : Macmillan Co., 1955.
5. Walker, Helen M., "Elementary Statistical Methods", New York : Henry Holt & Co., 1943.

□ □

## MODULE 4(B) 1

### MEANING AND PURPOSE OF EVALUATION

#### 4(B)1.0 : Specific Objectives of the Module

During the course of a day every individual takes many decisions. The decision may be related to a simple activity, like what to wear, what mode of transport to use to go to office, etc., or a complex activity like, what profession to choose, whom to marry, etc. Similarly, there are numerous day to day decisions that teachers must make. Decisions are best made on the basis of a good deal of information. The success depends upon the extent to which the information is reliably collected. Thus, to improve the decision making process, there is need to have the knowledge of the measurement and evaluation process, its characteristics, etc. Thus, after reading this Module, the reader will be able :

- (i) to define measurement,
- (ii) to write the definition of evaluation,
- (iii) to differentiate between measurement and evaluation,
- (iv) to state different steps of evaluation,
- (v) to explain the interdependence of teaching, learning and evaluation,
- (vi) to differentiate between placement evaluation, formative evaluation, diagnostic evaluation and summative evaluation, and
- (vii) to list the uses of evaluation in education.



#### 4(B)1.1 : Definition of Measurement

Let us take an example before giving the definition of measurement. Suppose at the time of birth of a baby, the doctor takes the weight of the baby, and says that the baby's weight is 5 kg. This is a process of measurement. Let us consider the case of a student in an eleventh grade typing class. Along with other students, he was given a five minutes speed test and was found to type sixty words per minute with a total of ten errors. This is the process of measurement. In the first example, the phenomenon in question was "baby", and "typing" was the phenomenon in the second. The dimension to be measured was 'weight' in the former case and speed and accuracy in the latter. The status of baby's weight was precisely measured by the units '5 kg.' and in the second case the speed and accuracy was characterised by the units 'sixty words per minute and ten errors'. Thus, there are two important aspects of measurement—the dimension of the phenomena to be measured and assigning the units of measurement to the dimension in order to characterize the status of a phenomenon as precisely as possible. Hence measurement can be defined as a process of assigning units of measurement to dimensions of phenomena in order to characterize their status as precisely as possible. Good<sup>1</sup>, in dictionary of education, defines "measurement as the comparison of a quantity (exhibited by a particular case) with an appropriate scale for the purpose of determining (within the limits of accuracy imposed by the nature of the scale) the numerical value on the scale that corresponds to the quantity to be measured."

#### 4(B)1.2 : Definition of Evaluation

Under the previous caption we have noticed that the doctor measures the weight of the baby. He does not stop there. He knows what should be the weight of those babies who are classified as under weight, normal and over weight at the time of birth. The doctor compares the weight of the baby with this chart and says that the baby is normal in weight. Thus we can say that the doctor has passed a value judgment, but it could not have been done without measurement. In the second example cited above, the instructor consults the manual that gives the degree of speed and accuracy to be expected of students in the eleventh grade after given amount of instruction and accordingly assigns a grade of B. The B, meaning "good", was assigned because the boy's speed and accuracy exceeded to a certain degree what was to be expected, the standard.

1. Cartor v. Good (Ed.), "Dictionary of Education", New York : McGraw Hill Book Company, Inc. 1959 pp 337—38.

Here, too, the value judgement was passed on the basis of measurement. Thus, the evaluation can be defined as a process of assigning units of measurement to phenomena in order to characterize their worth or value, usually with reference to some social, cultural, or scientific standard. Good defines "evaluation as: (i) the process of ascertaining or judging the value or amount of something by use of a standard of appraisal; includes judgments in terms of internal evidence and external criteria, (ii) the consideration of evidence in the light of value standards and in terms of the particular situation and the goals which the group or individual is striving to attain; (iii) a judgement of merit, sometimes based solely on measurements, such as those provided by test scores, but more frequently involving the synthesis of various measurements, critical incidents, subjective impressions, and other kinds of evidence weighted in the process of carefully appraising the effects of an educational experience<sup>2</sup>.

#### 4(B)1.3 : Difference between Measurement and Evaluation

From the definition of measurement one can note that it is limited to the quantitative descriptions of the phenomenon. It does not include qualitative descriptions nor does it imply judgments concerning the worth or value of the phenomenon measured. On the other hand evaluation is a more comprehensive and inclusive term than measurement. Evaluation includes both quantitative and qualitative description of a phenomena plus value judgement concerning its desirability. Thus, both measurement and evaluation are related and their relationship is as follows :

$$\text{Evaluation} = \text{Quantitative description of phenomenon (measurement)} + \text{Value judgement}$$

OR

$$\text{Qualitative description of phenomenon (non-measurement)} + \text{Value judgement}$$

It may, therefore, be said that evaluation may or may not be based on measurement, but when it is, it goes beyond the simple quantitative description.

#### 4(B)1.4 : Steps of Evaluation

Evaluation is a process. Therefore it has certain well defined steps, as stated below :

- The first step of evaluation is to determine and clarify what is to be evaluated. Suppose a mathematics teacher wants to evaluate his teaching

2. Ibid., p. 209



at Standard III. The teacher has, first of all, to define what were the objectives of his teaching. If he says that one of the objectives was that the students will be able to multiply, add, subtract and divide three figure decimal digits, it shows that the teacher has defined clearly what is to be evaluated.

- The second step is to select the suitable tool for measuring the phenomenon under consideration. Suppose the teacher selects a test where items related to addition, subtraction, multiplication and division of three figure decimal digits are given. If the test items are sufficiently large in number as well as cover the field adequately the inferences based on the students' performance on the test would be justified. The teacher has selected a suitable tool for measurement.
- The third step is to measure the learning outcome by using the already selected tool. That is to say, the teacher has to administer the test which he has selected. After administering, he has to score and find how much each student has learned, which can be known from his total score.
- The fourth step is to compare the result of measurement with what is to be expected. From the score of students the teacher can find out whether the students could add, subtract, multiply and divide the three figure decimal digits or not. It is possible that one may find that 90% of the students could do whatever was expected.
- The last step is to pass judgement on the basis of comparison of the actual outcome with the expected outcome. Suppose in the present example, the teacher expected that 75% students can add, subtract, multiply and divide the three figure decimal digits but 90% of them came to his expectation. Therefore, one may say that the teaching was very good—which is a value judgement. This is based on measurement.

#### 4 (B) 1.5 : Interdependence of Teaching, Learning and Evaluation

All of us know that the main purpose of classroom teaching is to bring change in student behaviour in the desired direction. The term behaviour is used here in a broad sense to include all changes in cognitive, affective and psychomotor domains. When classroom teaching is viewed in this light, evaluation becomes an important part of the teaching-learning process. The interdependence of teaching, learning and evaluation can be seen clearly in the following steps involved in the instructional process.

- The first step in the instructional process is to define the instructional objectives in terms of desired learning outcomes. That is, what knowledge should the students possess at the end of learning experiences ? In short, what specific behaviour should be exhibited by

students at the end of teaching must be spelled out. Similarly for evaluation, too, the instructional objectives are to be defined in terms of desired learning outcomes. It is only by identifying instructional objectives and stating them clearly in terms of specific behaviour that one can provide direction to the teaching process and set the stage for ready evaluation of the learning outcomes.

- The second step is to know the present status of students' knowledge in reference to the future status. In other words, one must know the extent to which the prerequisites are possessed by the students. This can be done by evaluating students' knowledge and skill at the beginning of the instruction. The outcome of evaluation at this stage is very important because it is useful in planning remedial work for students who lack the pre-requisite skills, in revising the instructional objectives, and in modifying the instructional plans to suit the needs of the learners.
- The third step is to provide relevant instruction so as to achieve the desired learning outcomes. During this instructional phase, testing and evaluation are necessary. This is because their results help in monitoring learning progress and diagnosing learning difficulties. Thus, periodic evaluation during instruction provides a type of feedback-corrective procedure that aids in continuously adapting instruction to group and individual needs.
- The final step in the instructional process is to determine the extent to which the instructional objectives have been achieved by the students. This is done by using tests and other measuring instruments that are specifically designed to measure the intended learning outcomes. That is to say, the instructional objectives will clearly specify the desired changes in student behaviour, and the measuring instruments will provide a relevant measure of the same behaviour, for evaluation of the outcome.

Thus, in the steps of the teaching-learning process, we have seen the role played by measurement and evaluation and their interdependence.

#### 4 (B) 1.6 : Placement Evaluation

The placement evaluation is concerned with the students' entering behaviour. That is, it helps to find the prerequisites available for beginning the planned instruction. Secondly it helps to ascertain to what extent the students have already mastered the objectives of the planned instruction. If students have sufficient mastery of what is going to be taught, it indicates that this unit or topic is to be skipped and they are to be taught some advanced topic or unit. To know all these things a



variety of techniques, viz., readiness test, aptitude test, pre-test on course objectives, etc. may be used. Thus, the main aim of placement evaluation is to determine the starting point in the instructional sequence and the mode of instruction that are likely to provide optimum benefit to each student.

#### **4 (B) 1.7 : Formative Evaluation**

The formative evaluation is used to monitor learning progress of students during instruction. Its main objective is to provide continuous feedback to both teacher and student, concerning learning successes and failures. Feedback to students provides reinforcement of successful learning and identifies the specific learning errors that need correction. Feedback to teacher provides information for modifying instruction and for prescribing group and individual remedial work. The formative evaluation depends on tests prepared for each segment of instruction. These are usually mastery tests that provide direct measures of all the intended learning outcomes of the segment. The tests used for formative evaluation are mostly teacher-made. Observational techniques are also useful in monitoring student progress and identifying learning errors. Since formative evaluation is used for assessing student learning progress during instruction, the results are not used for assigning course grades.

#### **4 (B) 1.8 : Diagnostic Evaluation**

The diagnostic evaluation is concerned with the students' learning difficulties during instruction which are left unsolved by standard corrective prescriptions based on formative evaluation results. If a student fails continuously in any subject, then a more detailed diagnosis is required. The diagnostic evaluation is more comprehensive and detailed. It involves the use of specially prepared diagnostic tests as well as various observational techniques. The primary aim of diagnostic evaluation is to determine the causes of learning problems and to formulate a plan for remedial action.

#### **4 (B) 1.9 : Summative Evaluation**

The summative evaluation is designed to find out the extent to which the instructional objectives have been achieved and is used primarily for assigning course grade or for certifying student mastery of the intended learning outcome. The techniques used for summative evaluation are determined by the instructional objectives and they are teacher-made tests, ratings, etc. Although the main purpose of summative evaluation is assigning grades but it also provides information for judging the appropriateness of the course objectives and the effectiveness of the instruction.

**4 (B) 1.10 : Uses of Evaluation in Education**

Evaluation may be used for the following purposes :

1. Evaluation may be used to assess the entering behaviour of student in a sequence of instruction.
2. It may be used to assess the learning progress during instruction.
3. It may be used to assess student learning difficulties during instruction.
4. It may be used to evaluate the student achievement at the end of instruction.
5. It may be used in reporting student progress to parents.
6. Evaluation is useful for guidance and counseling.
7. It may be used to determine the effectiveness of course content, teaching method, school administration, etc.

**4 (B) 1.11 : Test Yourself**

1. Which of the following would be considered measurement and which evaluation ? Why ?
  - (a) Mohan has a good comprehension ability.
  - (b) Ram got 80 percent marks in physics test.
  - (c) Rita is poor in dancing but good in singing.
  - (d) Ashok had a score of 40 on the English test.
2. Classify each of the following by indicating whether it refers to placement evaluation, formative evaluation, diagnostic evaluation, or summative evaluation.
  - (a) The prerequisite or pre-test in history.
  - (b) Teacher-made test was used to assign grades.
  - (c) A unit test in science was used to measure mastery.
  - (d) A device for observing and recording reading errors.
3. Give the definition of evaluation in 6 to 8 lines only.
4. Define measurement in 6 to 8 lines only.
5. Write down the steps involved in the process of evaluation.
6. State any four uses of evaluation for the teacher.
7. Explain why should classroom evaluation be considered an integral part of the teaching-learning process in 20-25 lines.
8. Each of the following incomplete sentence is followed by a few alternative phrases. Encircle the serial number of the most suitable alternative for completing the sentence.
  - (a) To evaluate student learning progress, and identify and correct the learning errors is known as—
    - (i) summative evaluation
    - (ii) placement evaluation



- (iii) formative evaluation
- (iv) diagnostic evaluation
- (b) In order to make the results of evaluation more specific and accurate, learning outcomes are—before they are compared with educational objectives.
  - (i) evaluated
  - (ii) tested
  - (iii) measured
  - (iv) counted.
- (c) Evaluation is a .....process.
  - (i) progressive
  - (ii) regular
  - (iii) discontinuous
  - (iv) continuous.
- (d) A good evaluation programme takes into consideration.....
  - (i) all aspects of the students' development.
  - (ii) some aspects of the students' development.
  - (iii) only one aspect of the students' development.
  - (iv) many aspects of the students' development.
- (e) .....is used in teaching-learning process so as to determine the causes of persistent learning difficulties.
  - (i) Diagnostic evaluation
  - (ii) Formative evaluation
  - (iii) Summative evaluation
  - (iv) Placement evaluation.
- (f) Evaluation is equal to.....
  - (i) measurement
  - (ii) measurement plus judgement
  - (iii) non-measurement
  - (iv) value judgment.
- (g) In school education, evaluation should come.....
  - (i) at the end, i.e. after specifying the objectives and providing suitable learning experiences.
  - (ii) while providing learning experiences.
  - (iii) in the beginning, while specifying the objectives.
  - (iv) in all the above stages.
- (h) Results of continuous evaluation should lead the students towards.....
  - (i) learning

- (ii) the goal
- (iii) self-evaluation
- (iv) knowledge.
- (i) The purpose of placement evaluation is to.....
  - (i) assign grade.
  - (ii) identify difficulties related to teaching learning process.
  - (iii) determine possession of pre-requisites.
  - (iv) identify and correct learning errors.

#### 4 (B) 1.12 : Correct Answers

1. (a) Evaluation, for explanation to why see caption 4.1.2.  
 (b) Measurement, for explanation to why see caption 4.1.1.  
 (c) Evaluation, for explanation to why see caption 4.1.2.  
 (d) Measurement, for explanation to why see caption 4.1.1.
2. (a) Placement evaluation.  
 (b) Summative evaluation.  
 (c) Formative evaluation.  
 (d) Diagnostic evaluation.
3. Compare your definition with the one given under caption 4.1.2.
4. Compare your definition with that given under caption 4.1.1.
5. Compare your steps with those given under caption 4.1.4.
6. Compare your uses with those given under caption 4.1.10.
7. Compare the theme of your answer with the one given under caption 4.1.5.
8. a—iii, b—iii, c—iv, d—i, e—i,  
 f—ii, g—iv, h—iii, i—iii.

#### 4 (B) 1.13 : Suggestions for Further Reading

1. Adams, G.S., "Measurement and Evaluation in Education, Psychology, and Guidance", New York : Holt, Rinehart and Winston, 1964.
2. Bloom, B.S., Hastings, J.T. and Madaus G.F., "Handbook on Formative and Summative Evaluation of Student Learning", New York : McGraw-Hill Book Company, 1971.
3. Cronbach, L.J., "Essentials of Psychological Testing", New York : Harper and Row, Publishers, 1970.
4. Gronlund, N.E., "Measurement and Evaluation in Teaching", New York : Macmillan Publishing Co., Inc., 1971.
5. Rawal, D.S., "Measurement, Evaluation and Statistics in Education", New Delhi : New Raj Book Depot, 1970.
6. Yadav, M.S. and Govinda, R., "Educational Evaluation—A package of auto-instructional materials", Ahmedabad : Sahitya Mudranalaya, 1977.



## MODULE 4(B) 2

### TOOLS AND TECHNIQUES FOR EVALUATING OUTCOMES OF LEARNING

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#### 4(B)2.0 : Specific Objectives of the Module

In the previous module we have learnt different steps involved in the evaluation process. Of these the first step is to define what is to be measured—in terms of specific behavioural educational objectives. The second step is to choose appropriate tools of measurement. No single type of tool can be reliable, valid, comprehensive, objective and practicable for evaluating different objectives of education or outcomes of education. A teacher should be familiar with at least those tools which are commonly used in the teaching-learning process. This is important because by using an appropriate tool one will get reliable data. The evaluation will be done on the basis of these data. Since the data are reliable, the evaluation result will also be reliable. Thus, after reading this module, the reader will be able :

- (i) to name major tools of evaluation used in the school,
- (ii) to state characteristics of the different tools of measurement, and
- (iii) to write uses of different tools of measurement.

#### 4(B)2.1 : Classification of Tools of Measurement

There are large number of tools of measurement such as, written tests, oral tests, observational techniques, sociometric techniques, inventories,

etc. These can be classified under three main techniques of measurement, namely, testing techniques, observational techniques and self-reporting techniques. Testing techniques will include achievement tests both teacher-made and standardized, diagnostic tests, intelligence tests, and aptitude tests. Rating scales, check lists, anecdotal records and sociometric techniques will be discussed under observational techniques. Lastly, under self-reporting techniques, interview, and questionnaire will be discussed.

#### 4(B)2.2 : Achievement Tests

The achievement tests are widely used in the classroom by a teacher. They are being used for different purposes. Firstly, when the classroom teacher wants to measure whether students possess the pre-requisites skills needed to succeed in unit or course; or the extent to which students have already achieved the objectives of the planned instruction. Secondly, achievement tests are also used periodically during teaching-learning process in order to monitor student learning process and to provide ongoing feedback to students and teacher. Thirdly, they are used to identify exactly the student's learning difficulties either persistent or recurring. Lastly, achievement tests are used to assign grades.

Achievement tests are generally classified as teacher-made tests and standardized tests. Normally, teacher-made tests are used in schools. The results of teacher-made tests indicate student's achievement in relation to the instruction provided in a school. Results of these tests are of great help in improving the teaching-learning process. They help the teachers in understanding their students, in taking proper decisions about teaching, and testing the effectiveness of their own teaching. They motivate the students towards further learning and lead them towards self-evaluation. Since instruction provided differs from school to school, the results of teacher-made tests cannot be compared. The results of teacher-made tests can be interpreted differently. The scoring is not objective and there is no standard procedure of its administration. Further there are no empirical evidences in respect of reliability and validity of teacher-made test. Thus, they have their limited utility.

Standardized tests are available for individual school subjects. These tests possess certain characteristics which are spelt out in the following paragraphs :

1. The standardized tests consist of items of high quality. The items are pretested and selected on the basis of difficulty value, discriminating power, and relationship to clearly defined objectives in behavioural terms.



2. The directions for administering, exact time limit, and scoring are very precisely stated. Different persons can administer and score the test in same way.
3. Norms, based on representative groups of individuals, are provided as aids in interpreting the test scores. These norms are based on various age, grade, sex, regional, area, etc.,.
4. Information needed for judging the value of the test is provided. Before the test becomes available, the reliability and validity are established.
5. A manual is supplied that explains the purposes and uses of the test, describes briefly how it was constructed, provides specific directions for administering, scoring, and interpreting results, contains tables of norms, and summarizes available research data on the test.

Despite the above mentioned common characteristics of standardized tests, no two tests are exactly alike. Each test measures certain specific aspects of behaviour and serves a slightly different purpose. Further, some tests with similar titles measure aspects of behaviour that differ markedly, whereas other tests with dissimilar titles measure aspects of behaviour that are almost identical. Thus, one has to be careful in selecting a standardized test.

Normally, standardized tests are used for evaluating the general educational development of students in the basic skills and in those learning outcomes common to many courses of study. They are also used for evaluating student progress during the school year or over a period of years and grouping students for instructional purposes. The purpose of diagnosing relative strengths and weakness of students in terms of broad subject or skill areas can be achieved through the use of standardized tests.

Both the carefully constructed teacher-made tests and standardized tests are similar in many ways. Both are constructed on the basis of carefully planned table of specifications, both have the same type of test items, and both provide clear directions to the students. Still the two differ. They differ in the quality of test items; the reliability of the test measures; the procedures for administering and scoring; and the interpretation of scores.

### Comparison of Teacher-made Achievement Test and Standardized Achievement Test

<i>Point of Comparison</i>	<i>Teacher-made Achievement Test</i>	<i>Standardized Achievement Test</i>
1. Learning outcomes and content measured	They are well used to evaluate the outcomes and content of local curriculum.	They are well used to evaluate outcomes and content common to a number of schools.
2. Quality of test items	Quality of test items is unknown and is lower than that of items of standardized test.	General quality of items is high. They are pre-tested and selected on the basis of difficulty, and discriminating power.
3. Reliability	Reliability is usually unknown but it can be high if test items are carefully constructed.	Reliability is usually high and the value lies between .80 and .95.
4. Administration and Scoring	Uniform procedure of administration is possible but it is usually flexible.	The procedure of its administration is standardized and specific instructions for its administration and scoring are provided.
5. Interpretation of Scores	Scores can be compared and interpreted only in the context of the local school situation.	Scores can be compared to norm-groups. Test manual and other guides aid interpretation and use.

Both the teacher-made and standardized tests are used for different purposes. Standardized tests are useful when the purpose of testing is to compare a student's performance in different content areas ; to find the status of an individual student, class, or school system in a wider population ; to compare classes or schools among themselves ; and to measure growth over a period of years. On the other hand, teacher-made tests are used to determine whether specific curriculum goals have been achieved



and to compare students with their immediate classmate, as in assigning grades.

#### 4(B)2.3 : Diagnostic Tests

Generally we find that students have difficulties in understanding and learning certain concepts. The difficulties vary from individual to individual, subject to subject, grade to grade, and institution to institution. So in order to make teaching-learning process effective, it is essential to find the learning difficulties of students during instruction. This can be done by making use of diagnostic tests. The diagnostic tests consist items based on a detailed analysis of the specific skills involved in successful performance and a study of the most common errors made by students. The test difficulty is low. The lower difficulty is necessary in order to provide adequate discrimination among those students with learning disabilities. Thus, a good diagnostic test will permit a student to demonstrate all aspects of the skill being measured and will pinpoint the types of errors that he has made.

The diagnostic tests are available for different subjects. In order to select and use diagnostic tests, the different points to be kept in mind are :

1. While selecting a test, the diagnostic procedures should be evaluated in light of the specific type of information desired.
2. Diagnostic tests are designed for students of below-average performance. So they are useful in identifying weaknesses in learning but not for indicating the level of proficiency. If a student scores high on a sub-test, it simply means that this student does not have learning disabilities related to the area measured by the sub-test.
3. The diagnostic tests indicate the typical errors a student makes, but they do not indicate the causes of the errors. Still some causes can be easily inferred from the type of error made, or from a student's explanation of how he arrived at the answer.
4. The diagnostic tests provide only partial information for diagnosing a student's difficulty.
5. Results from diagnostic tests, concerning specific learning difficulties, tend to have a low reliability because of the relatively few items measuring each type of error. Therefore, the findings regarding specific strengths and weaknesses for any particular pupil should be regarded as clues to be verified by other objective evidence and by regular classroom observation.

In short it may be said that a diagnostic test is a useful tool for analysing learning difficulties. But in order to know the learning difficulties only a diagnostic test may not be sufficient. Therefore, supple-

mentary information concerning the physical, intellectual, social, emotional development of the student is also needed before an effective remedial programme can be initiated.

#### 4(B)2.4 : Intelligence Tests

Intelligence tests differ from achievement tests. The achievement tests attempt to measure specific skills, whereas the intelligence tests attempt to measure more general skills. Intelligence tests attempt to measure person's capacity to undertake difficult tasks; ability to perceive relationships; capacity to undertake activities that are complex and characterised by abstractness; solve problems; apply knowledge in a variety of contexts; etc. Many researches have been conducted to find the relationship between general intelligence and academic achievement and the results indicate a high correlation between them. This means intelligence and general scholastic achievement tests are good measures of each other. Then why do we need intelligence tests? The intelligence tests are used because of practical usability and convenience. Usually it is difficult to measure general scholastic achievement in as brief a time and with as short a test as it can be measured with intelligence tests. Normally, the achievement test in a single subject is as long as the average intelligence test. Now to measure general scholastic achievement, several of these achievement tests would be required. Furthermore, when students have varying educational backgrounds, come from different school systems etc., it is difficult to select an achievement test that is not prejudicial to some of them.

There are different types of intelligence tests. They are both verbal as well as non-verbal. Intelligence tests fall into two main patterns, group tests and individual tests. The type of tasks presented to the student (examinee) are a good deal alike in both patterns. However, the two procedures have certain significant differences. These are as follows :

- In group tests, problems are presented in printed booklets. They are read by the examinee (students) and there is minimum contact of the examinee with the examiner. On the other hand, in individual tests, problems are presented orally by the examiner in a face-to-face situation.
- In case of group tests, the test is timed as a unit, or separate time limits are set for each sub-test. While in case of individual tests, problems are presented one at a time, usually without indication of time limits.



- Lastly, in group tests each individual student usually responds by selecting one of a limited set of response options printed in the test booklet whereas in individual tests, individual student usually responds freely, giving whatever response seems appropriate to him.

There are various ways in which scores of intelligence tests may be used. Some of them are as follows :

- They may be used in determining reading readiness.
- In determining whether or not any student's achievement approximates his potential.
- In determining eligibility for subjects or courses requiring a high degree of intelligence.
- In vocational and educational guidance in secondary schools.
- In selection of reading materials for given classes.
- In assigning students to special classes or curricula.
- In identification of learning disabilities.

#### 4(B)2.5 : Aptitude Tests

Aptitude is defined by Good as, "a group of characteristics deemed to be symptomatic of an individual's ability to acquire proficiency in a given area : examples, might be a particular art, school subject, or vocational area."<sup>1</sup> The aptitude tests are designed to predict the student's future performance in some activity. Aptitude tests tend to be limited to tasks that are equally unfamiliar to all students (examinees) i.e. a novel or equally familiar situation, that is, all students have had equal opportunity to learn, regardless of their pattern of specific courses. The term "aptitude" can be used in two different ways :

- Sometimes one speaks of a person having considerable aptitude for a subject (such as reading, science, history, mathematics, etc.) or for a vocation (such as law, teaching, medical, etc.). In this sense of the word, "aptitude" connotes a combination of traits and abilities that result in the person's being well qualified for training in a subject, activity, or occupation. If one says that some one has mathematical aptitude, one means to say that he possesses a set of inter correlated skills, abilities, and characteristics that enable him to learn mathematics. These skills, abilities, and characteristics are the aptitude.
- The aptitude may be used in a narrow, more scientific sense to mean a discrete, unitary ability, such as numerical ability, spatial aptitude, etc., which has significance (in varying degrees) for a number of subjects, activities, and occupations.

1. Carter V. Good (Ed.) "Dictionary of Education," New York : Mc-Graw Hill Book Company, Inc. 1959, p. 38

Aptitude tests are of various types. They are verbal and non-verbal, and individually and group administered tests. The decision as to which type of test to select would depend upon the use for which the test is intended and the grade level at which the test is to be used. If one is interested in predicting success in school, a scholastic aptitude test of the omnibus type would suffice. That is, one needs a test that provides a composite score on a combination of abilities related to success in the academic aspects of the school programme. If one wants some estimate of learning potential that was relatively free of school experience, then separate measures of verbal and non-verbal abilities through different aptitude tests would be the best. If one wants to make differential predictions, or detect students who were extremely weak in numerical or verbal ability, then separate verbal and quantitative scores would be useful. On the other hand, if one wants to estimate variety of aptitudes for both instructional and guidance purposes, then a multiscore test would be favoured. The important point to keep in mind at the time of the selection of an aptitude test is to choose the type of test that best serves the intended purpose.

#### 4(B)2.6 : Rating Scales

Rating Scales come under the observational technique. They provide a systematic procedure for obtaining and reporting the judgments of observers. A rating scale consists of a set of characteristics or qualities to be judged and some type of scale for indicating the degree to which each attribute is present. The rating form itself is merely a reporting device. There are different types of rating scales. In order to make the rating effective, certain points are to be kept in mind and these are as follows :

- Rating scales must be in harmony with the objectives and desired learning outcomes of the school. The learning outcomes are to be stated clearly in behavioural terms and then only those behaviours that can be most effectively evaluated by ratings are to be selected.
- Only directly observable characteristics should be rated with the help of rating scales. Thus, the characteristics should be limited to those that occur in school situations so that the teacher has an opportunity to observe them and they should be clearly visible to an observer. Overt behaviours like participation in classroom discussion, seminar, games etc. can be readily observed and reliably rated.
- Many of the errors in rating arise from the use of general, vague trait characterisations and inadequate identification of the scale points. Therefore, the characteristics and points on the scale should be clearly defined.



- The exact number of points to be designated on a particular scale is determined largely by the nature of the judgements to be made. For crude judgements, fewer scale positions are needed. Usually there are seven points on a scale because beyond this it is difficult to make discriminations between two close points.
- Normally pooled ratings of several teachers will provide a more reliable description of student behaviour than that obtained from any one teacher. In average ratings, the personal biases of individual raters tend to cancel out each other. Combined ratings are applicable in those situations where the particular student comes in contact with a number of teachers.
- If several dimensions are to be rated for a given student, it is probable that each rating of each dimension will be influenced by the others and in the same direction. This is called the "halo" effect. If an initial rating is high, others will tend to be high; if low, the others will tend to be depressed. Another way of viewing "halo" effect is that the observer has a feeling about a person as a whole, and he then proceeds to record ratings that will justify this feeling. To overcome this type of error, you need to concentrate on each separate dimension you rate and consciously "shut out" your feelings about other dimensions or the person as a whole. Frequently rating scales are devised with the right extreme of a scale sometimes having a low value and sometimes a high value just to hamper the operation of a "halo" effect. Halo effect can be defined as a bias in ratings arising from the tendency of a rater to be influenced in his rating of specific traits by his general impression of the person being rated.
- Some observers are found to rate low and others to rate high, no matter who or what is being rated. If such proneness to over or under-rate is known, the observer must take steps to correct it or provide for an automatic correction after he has made his ratings. Lack of experience with the full range of variation in the item being rated is often a cause of consistently high or low ratings.

The uses of rating scales may be classified into three major evaluation areas : (1) procedure, (2) product, and (3) personal-social development.

*Procedure evaluation*—Rating Scales are useful in evaluating procedures because they direct our attention to the same aspects of performance in all students, and they provide a common scale on which to record our judgements. If the rating form has been carefully prepared in terms of specific learning outcomes, it also serves as an excellent teaching device. The dimensions and behaviour descriptions used in the scale make clear to the pupil the type of performance desired.



*Product-evaluation*—Where student performance results in some type of product, it is frequently more desirable to judge the **product rather** than the procedure. The rating scales help us to judge the products of all students in terms of same characteristics, and it emphasizes to the students those qualities desired in a superior product. In some situations, it is necessary or desirable to judge a product in terms of its overall quality rather than its separate features. Where this is the case, the products may be simply placed in a rank order, or they may be compared to a product scale. A product scale is a series of samples of the product which have been carefully graded to represent different degrees of quality.

*Evaluating Personal-Social Development*—The rating of personal-social characteristics represents a different process from that used in procedure and product evaluation. When judging procedures and products, the ratings are usually made during or immediately after a period of observation. On the other hand ratings in the area of personal-social development are obtained at periodic intervals and represent a kind of summing up of the general impressions a teacher has formed about his students. The ratings are based on observation but the observations tend to be casual and spread over an extended period of time. One can generally expect such ratings to reflect more of teacher's feelings and personal biases than those obtained at the end of a period of planned and directed observation.

#### **4(B)2.7 : Anecdotal Records**

The most valuable observational records are descriptions of significant incidents in the life of the student. These descriptions are frequently termed anecdotal records. In the anecdotal record, the teacher describes an incident, setting forth briefly and objectively the actual happenings, the setting of the incident, and (if desired) his own interpretation of the significance of the behaviour. The teacher's interpretation should be separate from the description of the incident and should always indicate whether or not the behaviour is typical of the student. The date and time of the day should always be indicated, as well as the setting of the incident and the type of group activity. The anecdotal records are important because the recorded observations are valid and reliable to the extent that they actually reproduce whatever was observed. The best anecdotal record is a sound motion picture. In practice this ideal is not achieved. What can be achieved is a relatively unambiguous record of things that a teacher noticed and thought important about a student's behaviour.

There are certain limitations of anecdotal records. The major limitation of anecdotal records is the amount of time required in maintaining an adequate system of records. Though this can be offset somewhat by



limiting observations and reports, still it is a time-consuming task. Another limitation is the difficulty of being objective when observing and reporting student behaviour. Ideally, one would like a series of verbal "snapshots" which accurately represent the student's actual behaviour. This is seldom attained. However, for the teacher's own biases, hopes, and preconceived notions inevitably enter into his observations and reports. But the training in observation and reporting can reduce such distortions to a minimum, but they cannot be eradicated entirely.

Anecdotal recording is used most frequently by teachers where social development is the expressed goal. In addition, counselors, school psychologists, social workers, and supervisors make extensive use of anecdotal records.

Proper anecdotal recording has the following characteristics.

- What is written down is what was seen or heard. Inferences, guesses, assumptions, are omitted unless they are clearly labeled as inferences, guesses, or assumptions.
- The observer has determined what aspects of behaviour are related to the dimension being appraised. He observes and records these only.
- If the record is to be cumulative, a plan of periodic observation and recording is established and adhered to.
- Words and phrases are used whose meaning is clear, and, as far as possible, unequivocal.
- Words and phrases are employed that are definable in terms of things rather than other words. Concrete statements are preferred to abstract ones.
- Words and phrases that have strong emotional connotations are avoided, i.e. love, hate, courteous, loyal, dishonest, etc.
- Words and phrases which express the observer's judgement, or his opinion, and not just his perception are to be avoided. The various judgemental terms such as, well-behaved, nervous, aggressive, happy, industrious, didn't try, etc. should be avoided.

#### 4(B)2.8 : Checklist

Both the rating scales and checklists are similar in appearance and use. The basic difference between them is that a rating scale provides opportunity to indicate the degree to which a characteristic is present or the frequency with which a behaviour occurs. On the other hand, the checklist calls for a simple "yes-no" judgement. It is basically a method of recording whether a characteristic is present or absent, or whether an action was taken or not taken. Therefore a check list should not be used where degree or frequency of occurrence is an important aspect of the appraisal. But checklists are especially useful in evaluating those perfor-

mance skills that can be divided into a series of clearly defined specific actions.

The checklists are useful in evaluating procedures, products and social-personal development. It is probably least useful in summarizing a teacher's general impressions concerning the personality and adjustment of students. This is because, here, we are largely concerned with the degree to which a characteristic is present or the frequency with which a certain behaviour occurs. When these finer discriminations are possible, we should generally favour the rating scale. Only where our appraisal is so rough that we are limited to a simple "present-absent" judgement. We should resort to the use of a checklist.

#### 4(B)2.9 : Sociometric Techniques

Sociometric techniques are used for studying the organisation of social groups and for evaluating the social acceptance of individual students and the social structure of a group. The basic procedure involves requesting the members of a particular group to indicate their first, second, and subsequent choices of companions on the basis of a specific criterion, usually for some particular activity. For example, the members of a group are asked, "whom would you like to work with on this project, or sit next to, or eat lunch with, or play with after school, etc. ?" Essentially, it is a study of the choices made by each person in a group. The choices obtained are plotted on what is called a sociogram, which shows the pattern of interpersonal relations in a group. Fig. 1 shows a sociogram, in which 'c' is the most frequently chosen member. He might be referred to as the star. D, C, and E choose each other. This represents a clique ; that is,

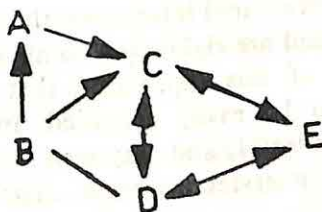


Fig. 1. Sociogram of a Group

three or more individuals mutually choose each other. B was not chosen by anyone although he did make choices within the group ; he is an isolate.

The sociometric technique can be used for variety of purposes in the school. Its major uses include : (1) organizing classroom groups, (2) improving the social adjustment of an individual student, (3) evaluating the influence of school practices on students' social relations.



Various suggestions are made for minimising the possibility of damaging after-effects. These include (1) using questions in which the choices made by students are actually put into effect; (2) emphasizing positive preferences rather than rejections or dislikes; (3) keeping the whole procedure as casual as possible; (4) managing efficiently so that questions and discussion of procedure can be kept to a minimum; and (5) giving careful consideration to the sociometric data when forming committees and other working groups. In addition, the teacher must be careful to avoid, in both his speech and his behaviour, conveying to the students the impression that popularity is the most important sign of personal worth. Finally, the teacher should regard sociometry as an exploratory technique in the study of students; when a student is discovered to be a neglectee, much more information needs to be obtained before the teacher has a sound basis for diagnosis.

#### 4(B)2.10 : Interviews

The interview is one of the most widely used assessment technique because of some unique qualities. One of the most important quality is that it is flexible. The rapport established with the subjects provides for a cooperative atmosphere in which truthful information can be obtained. One can take into consideration the kind of person one is interviewing and the situation within which the interview is taking place. The interviewer can elaborate on questions and explain to the students what the questions mean in case the students are not clear about the questions. None of these advantage is present with other measurement tools.

There are two types of interviews. One is structured and the other unstructured. In case of structured interviews, the questions are predetermined, put in a sequence, and are rigidly put to all students in the same manner. The advantage of this approach is that it is standardized and, therefore, the answers can be easily classified and analysed. Its disadvantage is that it is inflexible and may seem formal. Restrictions that are put on this type of interview increase their reliability but may decrease their depth.

On the other hand, unstructured interviews are more informal. One can put any question to the student, during interview, regarding their views, attitudes, beliefs, values, etc. The unstructured interviews are flexible and are usually planned to suit the students and the conditions within which the interviews take place. The students are given freedom to go beyond simple responses to the questions asked and to reveal their views in any way they wish. The questions may deviate from the original plans and centre around points that seem to be important. Unstructured

interviews require expert, skillful, and alert interviewers. In this type of interviews, it is difficult to quantify the responses, but it does help to generate and clarify the dimensions present in the topic under consideration. The unstructured interviews are commonly used in counselling and guidance, in case studies, and in clinical psychology.

In order to make interviews effective, the following points are to be kept in view :

- Prepare for interview by obtaining and organizing pertinent information.
- Help the student to relax through an informal greeting, participation in some after-school activity, and/or discussion of pleasant topics of especial interest to him.
- Don't talk too much or dominate the interview situation.
- Be an active listener, watching for leads suggested by the student's conversation.
- Don't seem rushed or preoccupied and, also, don't moralize or pass judgement on a student's behaviour in such a way as to lower his self-respect.
- Talk at the student's level, maintaining an attitude of cooperation rather than a display of authority.
- Shift as much responsibility to the student as he is able to handle, help him to think through next steps.
- Don't try to accomplish too much in one interview.
- End the interview with a forward looking attitude, leaving the student with less anxiety and greater self-confidence.
- Make special note of the student's last comments as he leaves the interview situation : he may touch on problems that he wished to discuss but could not find the courage to propose earlier.

#### 4(B) 2.11 : Questionnaires

The interview technique of evaluation is more time consuming and expensive. Some of the information can be gathered by means of a written questionnaire presented to the students. In a questionnaire written instructions are given to all students regarding the way the responses are to be recorded; and the personal appearance, mood, or conduct of the questioner does not effect the results as it does in the case of the interview.

The questionnaires are of two types, one is the structured or closed form and the other unstructured or open form. A structured questionnaire contains the questions and alternative answers to them. The answers provided for each question should be exhaustive of all possible responses



and at the same time mutually exclusive. On the other hand, unstructured questionnaires do not include suggested answers. The administration and scoring of structured questionnaire is straight forward and the results can be easily analysed. It has the disadvantage of forcing students to choose one of a number of preselected alternative answers to questions for which they might feel they did not have a clear answer, or that does not represent their attitude. On the other hand unstructured questionnaires have the advantage of giving freedom to the students to reveal their opinions and attitudes. The disadvantage is that the information gathered through it cannot be easily analysed. Secondly, while responding students may omit important points or emphasize those points which are not relevant to the purpose of evaluation.

The common disadvantages are : the questions may be misinterpreted by the students and it is difficult to get all the mailed questionnaires. To make the questionnaire effective, the following considerations are to be kept in view :

- The questionnaire must deal with a significant topic in the particular field in which it is used.
- During the process of constructing the questionnaire numerous revisions are to be done in order to eliminate ambiguous or unnecessary items.
- Keep the questionnaire as brief as possible so that it requires a minimum of the respondent's time.
- The questionnaire must be accompanied by a cover letter which explains the purpose and value of the information collected through it.

#### 4(B) 2.12 : Test Yourself

1. A few incomplete sentences are given below. Each incomplete sentence is followed by a few alternative phrases. Of these, one alternative is most suitable to make the incomplete sentence complete and meaningful. Encircle the serial number of the most suitable alternative which you choose.
  - (a) Tests used for the purpose of determining learning difficulties of students during instruction are called.....
    - (i) achievement tests
    - (ii) diagnostic tests
    - (iii) classroom tests
    - (iv) aptitude tests
  - (b) Students learning in different subjects can evaluated by using.....
    - (i) aptitude tests
    - (ii) classroom tests

- (iii) diagnostic tests
- (iv) achievement tests
- (c) Achievement tests are.....
  - (i) teacher-made tests
  - (ii) standardized tests
  - (iii) both teacher-made tests and standardized tests
  - (iv) none of the above
- (d) For evaluating learning outcomes which are common to many courses of study,.....tests are used
  - (i) standardized
  - (ii) aptitude
  - (iii) teacher-made
  - (iv) intelligence
- (e) The results of teacher-made tests have to be considered in relation to the.....
  - (i) instruction provided in the particular school
  - (ii) intelligence of students
  - (iii) students abilities to learn
  - (iv) special abilities of students
- (f) One has to select a particular test for evaluation primarily on the basis of.....
  - (i) students' intelligence level
  - (ii) teachers' intelligence level
  - (iii) what is to be evaluated
  - (iv) students' level of achievement
- (g) In order to evaluate an individual's ability to acquire proficiency in a given area,.....tests are used.
  - (i) intelligence
  - (ii) achievement
  - (iii) diagnostic
  - (iv) aptitude
- (h) .....is an observational technique.
  - (i) standardized achievement test
  - (ii) rating scale
  - (iii) interview
  - (iv) questionnaire
- (i) The social relationships among different groups of students may be determined by using.....
  - (i) intelligence tests
  - (ii) interview technique
  - (iii) social status tests
  - (iv) sociometric techniques



- (j) A technique by means of which a student's behaviour and responses are recorded, as they occur, by teachers observing them is called.....
- (i) observational method
  - (ii) self reporting method
  - (iii) practical method
  - (iv) diagnostic method
- (k) The descriptions of significant incidents in the school life of the students are termed as.....
- (i) teacher's notes
  - (ii) progress record
  - (iii) anecdotal records
  - (iv) records
- (l) The opportunity to indicate the degree to which a characteristic is present is provided by a.....
- (i) check list
  - (ii) sociometric technique
  - (iii) interview
  - (iv) rating scale
- (m) The presence or absence of a characteristic can be known through the use of.....
- (i) check list
  - (ii) records
  - (iii) notes
  - (iv) rating scale
- (n) Tests used to measure students' ability to learn, to think abstractly, and to adjust are called.....
- (i) general tests
  - (ii) aptitude tests
  - (iii) achievement tests
  - (iv) intelligence tests
- (o) The rating scales can be used for evaluating.....
- (i) procedures
  - (ii) products
  - (iii) personal social-development
  - (iv) all the three

2. Write down, in brief, the characteristics of standardized tests.

3. List any four points which you will keep in mind while selecting diagnostic tests for the purpose of diagnosing the learning difficulties of students.

4. Mention any five uses of scores of intelligence tests.
5. Define halo effect in 5-6 lines.
6. List any three points which can make rating effective.
7. Write down any six characteristics of anecdotal records.
8. List any three uses of the sociometric technique.
9. List any nine points which can make an interview effective.
10. Write down different characteristics of questionnaires.

#### 4(B) 2.13 Correct Answers

1. a—ii, b—iv, c—iii, d—i, e—i, f—iii,  
g—iv, h—ii, i—iv, j—i, k—iii, l—iv,  
m—i, n—iv, o—iv
2. Compare the characteristics which you have written with those given under caption 4.2.2.
3. Compare the points you have written with those given under caption 4.2.3.
4. Compare the uses you have written with those given under caption 4.2.4.
5. Your answer should resemble in meaning with the following :  
“Halo effect is defined as a bias in ratings arising from the tendency of a rater to be influenced in his rating of specific traits by his general impression of the person being rated.”
6. Compare the points you have written with those given under caption 4.2.6.
7. Compare the characteristics you have written with those given under caption 4.2.7.
8. Compare the uses you have written with those given under caption 4.2.9.
9. Compare the points you have written with those given under caption 4.2.10.
10. Compare the characteristics you have written with those given under caption 4.2.11.

#### 4(B) 2.14 : Suggestions for Further Reading

1. Anastasi, A., “Psychological testing”, London : The Macmillan Company, 1968.
2. Cronbach, L.J., “Essentials of Psychological Testing”, New York : Harper and Row, 1970.



3. Gronlund, N.E., "Measurement and Evaluation in Teaching", New York : Macmillan Publishing Co., Inc., 1976.
4. Rawat, D.S., "Measurement, Evaluation and Statistics in Education," New Delhi : New Raj Book Depot, 1970.
5. Wrightstone, J.W., et al., "Evaluation in Modern Education", New Delhi : Eurasia Publishing House, 1964.
6. Yadav, M.S. and Govinda, R., "Educational Evaluation—A package of auto-instructional materials", Ahmedabad : Sahitya Mudranalaya, 1977.



## MODULE 4(B)3

### CHARACTERISTICS OF A GOOD TOOL

#### 4(B)3.0 : Specific objectives of the Module

In the previous module we have noted that different measurement tools are used depending upon the objectives with reference to which evaluation has to be done. Therefore, while selecting a specific tool, one has to consider its suitability for the particular aspect of development of the child that has to be evaluated. Further, the quality of evaluation outcomes would depend upon certain characteristics of tools. From the psychometric viewpoint, a tool must possess two characteristics if it is to be considered a good measuring instrument : the tool must give reliable and valid measures. Apart from these two characteristics, usability must also be possessed by a good tool. Each of these characteristics are discussed in detail in this Module.

#### RELIABILITY

After reading this section, the reader will be able :

- (i) to define reliability ;
- (ii) to write different methods of establishing reliability ;
- (iii) to interpret reliability coefficients ;
- (iv) to write different factors affecting reliability ;
- (v) to define usability ; and
- (vi) to list six practical aspects involved in using an evaluation tool.



- Validity
- (vii) to define validity,
  - (viii) to describe different methods of establishing validity,
  - (ix) to state different factors affecting validity,

- Usability
- (x) to define usability,
  - (xi) to list different practical aspects that should be considered while selecting an evaluation tool.

#### 4(B)3.1 : The Concept of Reliability

Reliability means the consistency of test scores or other evaluation results from one measurement to another. It has three characteristics. Firstly, reliability refers to the results obtained with an evaluation instrument, and not to the instrument itself. Therefore, depending upon the group involved and the situation in which it is used, an instrument may have a number of reliabilities. Thus it is more appropriate to speak of the reliability of "the test scores", or of "the measurement", than of "the test", or "the instrument". Secondly, an estimate of reliability refers to a particular type of consistency. Test scores are not reliable in general. They are reliable over different periods of time, over different samples of questions, over different raters. It is possible for test scores to be consistent in one of these respects and not in another. The appropriate type of consistency in a particular case is dictated by the use to be made of the results. Lastly, reliability is primarily statistical in nature. Logical analysis of a test will provide little evidence concerning the reliability of the scores. The test must be administered, one or more times, to a group of persons and the consistency of the results is determined. This consistency may be expressed in terms of shifts in the relative standing of persons in the group or in terms of the amount of variation to be expected in a particular individual's score. Consistency of the first type is reported by means of a correlation coefficient called a reliability coefficient. Whereas consistency of the second type is reported by means of the standard error of measurement. Both these methods are widely used but they are primarily useful with norm-referenced measures.

#### 4(B)3.2 : Methods of Determining Reliability

There are four methods of establishing reliability of a test, of the first type. These are test-retest ; equivalent forms; split-half and Kuder-Richardson. Each of them is explained separately as under.

#### 4(B)3.2a Test-retest Method

For establishing reliability by means of test-retest method, the same test is administered twice to the same group of students with a given time interval between the two administrations of the test. With the help of these two sets of scores, correlation is computed. This correlation coefficient provides a measure of stability; that is, it indicates how stable the test results are over the given period of time. Thus, this correlation coefficient can also be referred to as a coefficient of stability.

The time interval between testings can vary from several minutes to several months. Because of this different values of the reliability coefficient can be obtained depending on time between testings and the reliability coefficients decrease progressively as this interval lengthens. Of course, it is not time per se that causes the changes in reliability coefficients but it is the experiences of the individuals between testings.

There are certain assumptions made when one computes a coefficient of stability. Firstly, the characteristics being measured by the test is stable over time. This assumption leads to certain ambiguity : if the trait is assumed stable but the test-retest reliability is low, one cannot say whether the assumption was wrong or extraneous conditions produced the lack of consistency. On the other hand, if one assumes that the trait is unstable but reliability coefficient is high, one cannot say whether the assumption was wrong or some systematic bias was producing high correlation. Therefore, the meaning of a coefficient of stability can only be interpreted within the context of one's full knowledge of the trait being measured by the test. Second assumption is that practice or forgetting do not effect significantly the trait being measured by the test. That is, when a test is repeated, especially after a short interval, some people may remember their responses or learn something about the technique of taking a test. In either case, if one person's score is influenced more than another person's score, reliability is lowered. Lastly, no differential learning should occur between the two administrations. If students learn different amount during the time interval between the two testings, it will be reflected in poor correlation and reliability will be decreased.

#### 4(B)3.2b Equivalent-forms Method

Determination of reliability by means of equivalent forms method involves the use of two different but equivalent forms of the test. They are also called parallel or alternate forms. Equivalent forms cover the same content, use the same types of items, instructions, time limits, format, and are of equal difficulty. The two forms of the test are administered to the same group of subjects in close succession or with a



minimum time lag. From the two sets of scores, the correlation coefficient is computed. This correlation coefficient provides a measure of equivalence. Thus, it indicates the degree to which both forms of the test are measuring the same aspects of behaviour. That is, if the value of correlation coefficient is high, it indicates that both forms are measuring the same content and therefore probably reliable samples of the general area of content are being measured.

In this method, inconsistencies in scores can be attributed primarily to differences in content sampling or item sampling. Since the two forms of the test are given close together in time, long-term fluctuations are eliminated. But short-term fluctuations in the test taker's mood or differences in administration of the two forms are not entirely controlled. Thus, a pure measure of equivalence is not obtained. However, the major source of variance will be the difference between content or items in the two forms of the test.

This method is sometime used with some time interval between the administration of the two forms of the test. Under these conditions, the resulting reliability coefficient provides a measure of both stability and equivalence. In this situation the stability of testing procedures, the constancy of the pupil characteristic being measured, and the representativeness of the sample of tasks included in the test are all taken into account. Here, also, the reliability coefficient must be interpreted in the light of time interval between the two forms of the test. Longer interval between the two administration, will lower the reliability coefficient.

#### 4(B) 3.2c : Split-half Method

The two methods discussed so far are time consuming. This problem may be overcome by following split-half method for establishing the reliability of a tool. For this method the test is to be administered once to a group of selected students. To find split-half reliability, the test has to be split into nearly comparable halves. A test can be divided in a large number of ways. In most cases, the first half and the second half of a test would not be comparable, because of differences in nature and difficulty level of items, as well as to the cumulative effects of warming up, practice, fatigue, boredom, and any other factor varying progressively from the beginning to the end of the test. If the items are arranged in an approximate order of difficulty, then the test may be split into two halves by using odd-numbered items in one half and even-numbered items in the second half. This method would give two comparable halves. Such a split pertains to groups of items dealing with a single

problem or concept. If there are items dealing with different concepts, there should be items in both the halves, which represent all the concepts.

Once the two comparable halves are obtained, two scores can be obtained for each student of the group. From these two sets of scores, the correlation can be computed by following the usual method of correlation. This correlation actually gives the reliability of only a half-test. Since reliability is dependent on test length, the reliability estimated from the correlation between odd and even items will be lower than the reliability expected from a test of the original length. To estimate the reliability of a test of the original length one can use the Spearman-Brown formula :

$$r_{xx} = \frac{2r_{hh}}{1+r_{hh}} \quad \dots (1)$$

Where  $r_{hh}$  is the split-half reliability coefficient Or Correlation Coefficient between odd and even items and  $r_{xx}$  is the estimate of the reliability of the test of the original length. Hence by using equation (1) the reliability coefficient of a test can be calculated.

#### 4(B) 3.2d : Kuder-Richardson's Internal-consistency Reliability

This is another method for finding reliability of a test. To compute this, the test is to be administered only once. Its value depends largely on the consistency of students' responses to all items in the test, that is, the inter-item correlation. This correlation is influenced by two sources of error variance : (i) content sampling and (ii) heterogeneity of the behaviour domain sampled. The more homogeneous the domain, the higher the inter-item correlation, and, hence, the internal consistency reliability. Hence, when the test is heterogeneous, i.e., has items testing different abilities, this method yields a lower reliability coefficient than any other methods of reliability.

Various formulas have been developed by Kuder and Richardson for estimating internal-consistency reliability but the most widely applicable formula commonly known as "Kuder-Richardson formula 20" is the following :

$$r_{11} = \left( \frac{n}{n-1} \right) \frac{\sigma_t^2 - \sum pq}{\sigma_t^2}$$

Where  $r_{11}$  = the reliability coefficient of the whole test

$n$  = the number of items in the test

$\sigma_t$  = the standard-deviation of total scores of the test.

$\sum pq$  is found by tabulating the proportion of persons who pass ( $p$ ) and the proportion who don't pass ( $q$ ) each item. The product of  $p$  and  $q$  is



computed for each item, and these products are then added for all items, to give  $\Sigma pq$ .

#### 4(B) 3.3 : An Overview

The different types of reliability coefficients discussed above are summarized in Table.

**Table : Technique for measuring reliability in relation to test form, testing session and error variance.**

<i>Techniques for measuring reliability</i>	<i>Testing sessions required</i>	<i>Test forms required</i>	<i>Error Variance</i>
Test-retest	Two	One	Time sampling
Equivalent Form (immediate)	One	Two	Content sampling
Equivalent-Form (Delayed)	One	Two	Content sampling and time sampling
Split-half	One	One	Content sampling
Kuder-Richardson	One	One	Content sampling and content heterogeneity

#### 4(B) 3.4 : Interpretation of a Reliability Coefficient

There are certain considerations which must be kept in mind while interpreting reliability coefficient. First, the reliability of a test as estimated by one technique, in one situation, and with one sample will not be the same as an estimate obtained with a different technique, in a different situation, or with a different sample. Second, a reliability coefficient is only an estimate of the magnitude of inconsistency in test scores ; it does not indicate the causes of the inconsistency. Lastly, reliability is not the be-all and end-all of a measuring tool ; it is not an end in itself but rather

a step on a way towards a goal. That is, unless test scores are consistent, they cannot be related to other variables with any degree of confidence. Therefore, reliability places limits on validity.

A reliability coefficient can be interpreted in terms of the proportion of variance in the obtained scores which represents variance in true scores. For example, a reliability coefficient of 0.85 can be interpreted to mean that 85 percent of the variability in obtained scores is due to differences in true scores and 15 percent is due to errors of measurement. Thus, the reliability coefficient tells us what proportion of the variance in obtained scores is due to differences in true scores and what proportion is measurement error. Since reliability is specific to each testing situation, a reliability coefficient indicates the extent of measurement error obtained when a given form of a test is administered to a particular sample of people under a specified set of conditions. Hence, the less the proportion of error due to measurement, the more reliable the test scores.

#### **4(B) 3.5 : Factors Affecting Reliability**

A number of factors have been shown to affect reliability. If sound conclusions are to be drawn, these factors must be considered while interpreting reliability coefficients. The factors affecting reliability are explained below :

##### **4(B) 3.5a : Length of Test**

The longer the test, the greater its reliability. A test usually consists of a number of sample items, which are, theoretically, drawn from a universe of test items. If it were possible to use the entire universe of items, the score of a person who takes the test would be his true score. A theoretical universe of items consists of an infinite number of questions and is not practically definable. Therefore, one constructs a test, that is takes a sample from an imaginary and theoretical universe. The greater the length of the test, which means the greater number of items included in the test, the more representative it should be of the true scores of the person who takes it. Since reliability is the extent to which a test represents the true scores of individuals, the longer the test, the greater its reliability, provided that all the items in the test belong to the universe of items.

##### **4(B) 3.5b : Difficulty of Test**

Tests which are too easy or too difficult for the group taking it, will tend to provide scores of low reliability. This is due to the fact that both



easy and difficult tests result in a restricted spread of scores. In the case of an easy test, the scores are close together at the top end of the scale. On the other hand, in a difficult test, the scores are grouped together at the bottom end of the scale. But for both, the differences among individuals are small and tend to be unreliable.

#### 4(B) 3.5c : Heterogeneity of Group

The reliability coefficient increases with the spread or heterogeneity of the subjects who take the test. Conversely, the more homogeneous the group is with respect to the trait being measured, the lower will be the reliability coefficient.

#### 4(B) 3.5d : Methods of Estimating

Different methods for estimating the reliability of tests result in different coefficients of reliability. The equivalent-forms method with time interval gives a lower estimation of reliability than either test-retest or split-half method. This is because in the equivalent-forms method form-to-form as well as time-to-time fluctuations are present. The split-half method results in higher reliability coefficients than its alternatives. This is because the time-to-time fluctuation is the least in it.

#### 4(B) 3.5e : Speededness

Speed is another factor that can affect reliability. In fact, split-half reliability method is not appropriate when speed is a major factor in test performance. Suppose, one sets a 100 items test of simple arithmetic for sixth class students and keeps the problems so easy that with sufficient time, the students would give correct answers to all of them, but sets a restrictive time limit, so that no student can finish the test, one would produce a speeded test. Under these circumstances, a student who completes 90 items will probably get all 90 correct, 45 even and 45 odd; a student who finishes 80 items will probably get all 80 correct, 40 even and 40 odd; and so on. Thus each student will get the same score (with the exception of a few) on both halves. Thus the split-half reliability coefficient will be spuriously inflated, and nearly 1.

#### 4(B) 3.6 : The Concept of Validity

The validity of a test concerns what the test measures and how well it does so. If a test measures what it proclaims to measure, it is said to be valid; if it does not, it is invalid. Further, the validity of a test cannot be reported in broad terms. No test can be said to have "high" or "low" validity in general. Its validity must be determined with reference to the particular use for which the test is being considered.

The Validity pertains to the measurements of a test, or measuring instrument, and not to the instrument itself. Sometimes one speaks of the validity of a test for sake of convenience, but it is more appropriate to speak of the validity of the test results or more specifically, of the validity of the interpretation to be made from the results. Further, validity is a matter of degree. It is best considered in terms of categories that specify degree, such as high validity, moderate validity, and low validity.

#### 4(B) 3.7 : Types of Validity

There are four main types of validity. They are, content validity, predictive validity, concurrent validity and construct validity.

##### 4(B) 3.7a : Content Validity

The content validity refers to the degree to which a test samples the content area which is to be measured. This concept can be put in the form of question : How well do the items in this test represent the universe of all items which might be related to the topic or subject ? If a test constructor makes a test to measure the attainment after a course on 'reliability', the test should contain items related to different aspects of reliability and the specific objectives of the course in order to have 'Content Validity'.

The content validity is essentially and of necessity based on judgement. The test maker, usually, asks a number of experts to examine the items systematically and indicate whether or not they represent sufficiently well the theoretical universe from which they were drawn. All major aspects of the content area must be adequately covered by the test items, and they must be in the correct proportions. All the major objectives of instruction must be included, as well as the subject matter. If the emphasis in a class has been on understanding and application of scientific principles, then the test content must reflect this approach. A test requiring factual information only would have low content validity for this particular course. It is not possible to devise an objective index that can be used to measure the extent to which a test has content validity. Those who make judgements on the Content Validity of an instrument or tool do so largely on the basis of their expertise in the field.

Further, a subjective evaluation by judges as to what a measuring device appears to measure is referred to as face validity. When one makes a snap judgement as to whether a test is valid for certain purposes by reading over the items but without any objective evaluation, one is, in fact, assessing the face validity of the test. Judging a test on what it



appears to measure is a poor substitute for assessing what it actually measures. It is unfortunate that many test constructors fail to go beyond face validity.

It is difficult to discard face validity altogether because of its subjectivity. Normally, when one writes questions for a test, or collects items for a tool, the face validity concept is usually employed. Especially, in cases in which the universe of content items is difficult to picture, face validity provides a useful starting point.

#### **4(B) 3.7b : Predictive Validity**

Predictive validity is second type of validity. It refers to the extent to which a test can predict the future performance of individuals. One can say that the test has predictive validity only when it can effectively indicate how a person will do on a future task. This type of validity is important for those tests which are to be used for selection and classification purposes. The predictive validity is established by correlating the test scores with subsequent measures on a criterion. Suppose one wants to construct a test which can be used for selection of candidates for teacher's training programme. For such a test, predictive validity will be established. In this case one has to locate and define the criterion which is the index of teacher effectiveness. Then the correlation between the test scores and criterion is worked out. This correlation co-efficient is known as validity coefficient. The degree to which a test can predict the future performance of individuals depends on the degree of relationship between the two variables, the test and the criterion. The higher the relationship between these variables, the greater will be the predictive validity of a test.

In this method the most important and difficult thing is to locate the criterion which is the index of future performance. Once this is done then one can find the degree to which the tool can actually predict that criterion. The usual procedure for establishing predictive validity is to administer the tool to a representative group of those on whom the measure will be used for predictive purposes. The scores of these candidates on the tool are not used to make any decisions that might influence subsequent events for this particular group. Contamination of the criterion data is thereby prevented. Then one does a follow-up of the original group when the criterion data become available. Through correlation, one determines how closely predictions from the original test scores agree with the observed outcome. That is, one determines the extent to which the predictor has successfully predicted the external criterion. Predictive validity is reported through a coefficient of correlation obtained when predictor and the criterion data are correlated.

The higher the correlation coefficient, the more accurately the tool predicts the future outcomes. For example, one wants to establish the predictive validity for a scholastic Aptitude Test of the College entrance examination. This test will be administered to a representative group of those who are entering into the college. This group was followed until they finished college. Their scores on Scholastic Aptitude Test were correlated with their examination scores which they obtained after completing the college. The coefficient of correlation obtained is called the predictive validity of this test.

Establishing the predictive validity is a tedious job and it requires time and patience. Many a time it is necessary to wait for years to find whether or not high performance in a test corresponds to success in a future job.

#### **4(B) 3.7c : Concurrent Validity**

The third type of validity is the concurrent validity. It refers to the relationship between scores on a measuring tool and a criterion available at the same time. The concurrent validity differs from predictive validity only on time dimension. In predictive validity the relationship between the scores of individuals in a test and performance in a future task is determined. On the other hand, in concurrent validity the relationship between test scores of individuals and a present criterion is computed. Thus, the former is more time consuming method as compared to the latter.

Some times concurrent validity is used as a substitute for predictive validity. But concurrent validity is appropriate for those tests which are to be employed for diagnosis of existing status of the candidate rather than predicting about his future outcome. For example, personality tests that are used for screening purposes or for distinguishing between certain pathological groups and normals must have concurrent validity. Such a test would be used to tell whether Mr. 'X' is neurotic at the movement, not whether Mr. 'X' is likely to become neurotic in the future. The concurrent validity for the Minnesota Multiphasic Personality Inventory (MMPI) was established by administering the inventory to a number of hospitalized mental patients and a group of "normal" individuals. The extent to which the test could distinguish between normals and mental patients provided an indication of the concurrent validity of the MMPI.

#### **4(B) 3.7d : Construct Validity**

Construct validity is the fourth type of validity. It refers to the extent to which a test reflects constructs presumed to underlie the test



performance and also the extent to which it is based on theories regarding these constructs. Instead of asking how well this test samples a content area, or how well it predicts future performance, one asks how well the relationship between the test items and the corresponding behaviour could be justified. Thus, this type of validity requires the use of hypotheses drawn from theories regarding the nature of the qualities that are to be measured and from observations and experiences with these traits and qualities. For example, in validating a test of intelligence, one would not be concerned with how well the test samples behaviour directly related to a criterion, but rather how well it corresponds with an acceptable theory of intelligence.

Common examples of constructs are intelligence, scientific attitude, critical thinking, creativity, study skills, reading comprehension, mathematical aptitude, etc. Each construct has an underlying theory which can be brought to bear in describing and predicting a person's behaviour. For example, if one says a person is highly intelligent, one knows what behaviours might be expected of him in various specific situations.

The process of determining construct validity utilizes both an empirical and a logical approach. One usually makes a number of inferences from theory, research findings and experience regarding the trait to be tested, then attempts to find experimentally how well the test corresponds with these inferences. Suppose one constructs a test to measure the trait of conformity. From theory in the area, from research findings and from one's experience it could be deduced that a conformist is a person who does not resist group pressure, who is anxious to please his peer group, whose behaviour corresponds with the norms and values of his society, etc. Now this test of conformity would have constructed validity if it measures these qualities and characteristics. That is, individuals with high scores in this test should possess these qualities and those with low scores should possess the opposite traits. Each of these hypotheses should be tested by determining how well the test scores correlate with independent observations of these traits. Thus, the various steps involved in determining construct validity are :

- (i) identifying the constructs presumed to be assessed by test performance,
- (ii) deriving hypotheses regarding test performance from the theory underlying the construct; and
- (iii) verifying the hypothesis by logical and empirical means.

If all the hypotheses are confirmed, one could conclude that the test has construct validity.

**4(B) 3.8 : Factors affecting Validity**

Any factor that affects the test scores or the criterion measures will influence the validity of the test results.

**4(B) 3.8a : Factors related to Test Itself**

Each test contains directions regarding the manner in which responses are to be recorded. The direction, if unclear, will bring error and the validity will be affected. The test items should not contain difficult words which may hinder student's comprehension. The items which are too easy or too difficult will not provide enough discrimination among students and will therefore lower validity. The items which are poorly constructed are going to have low validity. If a test is too short to provide a representative sample of the behaviour, the validity will suffer accordingly. If the test, contains difficult items in the beginning, the students will spend too much time on them and fail to reach the items that they could easily answer. Moreover, they may get discouraged at the very beginning. Thus, the improper arrangement may also influence validity of the test. Hence it may be said that any defect in the construction of the test which prevents the test items from functioning for the fulfilment of the intended use will contribute to the lowering of the validity of the measurement.

**4(B) 3.8b : Functional Proficiency**

The functional proficiency of a test cannot be determined merely by examining the form and content of the items. For example, suppose a test is constructed to measure arithmetical reasoning. If the teacher has taught the solution to the type of questions given in the test before administering the test, the test items no longer measure arithmetical reasoning but measures memorized knowledge. Hence the test does not serve the purpose for which it is meant. Thus, the validity is affected. The tests of understanding, critical thinking, and other complex learning outcomes are valid measures in these areas only if the test items function as intended.

**4(B) 3.8c : Factors in Test Administration and Scoring**

Another factor which may influence the validity of the test is related to administration and scoring of a test. Factors such as insufficient time to complete the test, cheating during the examination, unfair aid to individual students who ask for help, unreliable scoring of easy answers would tend to lower validity.



**4(B) 3.8d : Factors in Student's Responses**

Many a time the validity of a test is affected due to personal factors influencing the student's response to the test situation rather than to any short-comings in the test or tool. If an individual is emotionally disturbed at the time of giving the responses, his test performance is likely to be affected. Majority of students are frightened by the test situation and thereby unable to respond normally. These and some other factors which restrict and modify responses in the test situation are bound to lower the validity of the test results.

**4(B) 3.8e : Nature of the Group and the Criterion**

The validity of a test is also influenced by the nature of the group for which it is constructed. Validity is always specific to a particular group. The age, sex, ability level, educational background, cultural background, etc. are some of the characteristics of a group which may influence the validity of a test. How closely the test pertains to the significant characteristics of the group of students one wishes to test determines how valid are the measures for the particular group.

It is also necessary to consider the nature of the criterion used. For example, one may expect scores on a critical thinking test to correlate more highly with scores in social studies courses which emphasize critical thinking than with those which depend largely on the memorization of factual information. Thus, the greater the similarity between the behaviours measured by the test and the behaviours represented in the criterion, the higher will be the validity of the test.

**4(B) 3.9 : The Concept of Usability**

So far we have learnt about reliability and validity. The tools to be used in evaluation must possess these two characteristics. Alongwith these it is important to consider the usability of tests and other evaluation tools. Usability of a test refers to various practical aspects of the evaluation process that should be considered. Particularly in our schools, with limited resources, consideration of this factor becomes essential. Usability includes such practical aspects as ease of administration, time required for administration, ease of scoring, ease of interpretation and application, availability of equivalent or comparable forms, and cost. Each of them are explained in the following paragraphs.

**4(B) 3.9a : Ease of Administration**

Ease of administration is important and is to be kept in mind while selecting a test for use. There are tests which require special training for

their administration. Our schools lack trained teachers who may administer all sorts of tests. For ease of administration it is essential that the directions are simple and clear, subtests are relatively few, and the timing of the test is not too short. If all this is not taken into account, the validity and reliability of test scores are likely to be affected.

#### **4(B) 3.9b : Time Required for Administration**

Another practical consideration to be taken into account while selecting a test for use is the time required for administration. Other things, like, reliability, validity, etc., being equal, one must select a test which can be administered in shorter time. But these things are seldom equal because reliability is directly related to the length of the test. If one attempts to cut down too much on the time allotted to testing, one is likely to reduce drastically the reliability of test scores. Thus, it is better to select a test which require less time for administration but is able to obtain valid and reliable results.

#### **4(B) 3.9c : Ease of Scoring**

The most tedious aspect of an evaluation process is the scoring of the tests. Sometimes the procedures of scoring of certain tests are tedious. Therefore, it is important to select those tests which require a minimum amount of time, skill and expense for scoring. In other words, other things being equal, one should favour the test which provides for ease and economy of scoring without sacrificing scoring accuracy.

#### **4(B) 3.9d : Ease of Interpretation and Application**

The success of a testing programme is determined by the extent to which the test results are made use of. If the results are interpreted correctly and applied effectively, they will contribute to more intelligent educational decisions. Thus, it is essential to select a test whose raw scores can be converted into meaningful derived scores, the clarity with which the tables of norms are presented, and the comprehensiveness of the suggestions for applying the results to educational problems. Ease of interpretation and application should be given special consideration in those situations where the results are to be presented to students, or to their parents.

#### **4(B) 3.9e : Availability of Equivalent or Comparable Forms**

There are many occasions where equivalent forms of the same test are often desirable. Equivalent forms of a test measure the same aspect of behaviour by using test items which are alike in content, level of difficulty, and other significant characteristics. Thus, one form of the test can



substitute for the other. This makes it possible to test pupils twice in close succession without their answers on the first testing influencing their performance on the second testing. Thus, this is another practical aspect to be taken into account while selecting a test.

#### 4(B) 3.9f : Cost

Another factor to be kept in view while selecting a test for use is its cost. This factor is relatively unimportant as compared to those which have been presented earlier. Testing is relatively expensive, hence, cost should not be a major consideration. In large scale testing programmes where small savings per student add up, using separate answer sheets, re-usable testbooklets, etc. will reduce the cost appreciably. The validity and reliability are important characteristics to look for, and a test lacking in these qualities is too expensive at any price. The contribution that valid and reliable test scores can make to educational decisions seems to indicate that such tests are always economical in the long run.

#### 4(B) 3.10 : Test yourself

1. In the following items incomplete sentences are given. Each incomplete sentence is followed by a few alternative phrases. Of these, one alternative is most suitable to make the incomplete sentence complete and meaningful. Encircle the serial number of the most suitable alternative which you choose.
  - (a) If the scores obtained through a test are consistent when administered at two different times, the test is said to possess———.
    - (i) validity
    - (ii) objectivity
    - (iii) reliability
    - (iv) usability
  - (b) If a test measures what it proposes to measure, the test is said to possess———.
    - (i) reliability
    - (ii) validity
    - (iii) usability
    - (iv) objectivity
  - (c) In order to establish test-retest reliability of a test———.
    - (i) two parallel tests are administered to the group.
    - (ii) the same test is administered to two groups.
    - (iii) the same test is administered twice to the same group with a given interval.

- (iv) the same test is administered twice to the same group with no time interval.
- (d) In order to establish split-half reliability of a test,———.
  - (i) the same test is administered at different points to two halves of the group.
  - (ii) the test is split into two halves, and both halves are administered to the same group at two different times.
  - (iii) two parallel tests are administered to the group.
  - (iv) the test is administered once to the group and then it is divided into two equivalent or comparable halves.
- (e) The inter-item consistency is influenced by error variance introduced due to———.
  - (i) content sampling
  - (ii) content analysis
  - (iii) sampling
  - (iv) time sampling
- (f) The formula used for calculating the reliability of the whole test is———.

$$(i) \quad r_{xx} = \frac{2r_{hh}}{1 - r_{hh}}$$

$$(ii) \quad r_{xx} = \frac{r_{hh}}{1 + r_{hh}}$$

$$(iii) \quad r_{xx} = \frac{r_{hh}}{2(1 + r_{hh})}$$

$$(iv) \quad r_{xx} = \frac{2r_{hh}}{1 + r_{hh}}$$

- (g) In test-retest method, the error variance is due to ——-.
  - (i) content sampling
  - (ii) time sampling
  - (iii) content sampling and time sampling
  - (iv) content heterogeneity
- (h) The error variance due to time sampling occurs, when the reliability is calculated by———method.
  - (i) Kuder-Richardson
  - (ii) test-retest
  - (iii) split-half
  - (iv) immediately administered equivalent form

2. Complete the following sentences with suitable word or words.

- (a) Various methods of establishing reliability are :
  - (i)
  - (ii)



- (iii)
- (iv)
- (b) The three characteristics one should look for before using a particular tool of evaluation in the school are :
  - (i)
  - (ii)
  - (iii)
- (c) The three ways of interpreting reliability coefficients are :
  - (i)
  - (ii)
  - (iii)
- (d) Factors that affect reliability are :
  - (i)
  - (ii)
  - (iii)
  - (iv)
  - (v)
- (e) Validity can be established by using various methods, such as,
  - (i)
  - (ii)
  - (iii)
  - (iv)
- (f) The extent to which the results are obtained through a test can be interpreted in terms of psychological concepts and principles known about the characteristic being measured is called its———.
- (g) Factors affecting validity are :
  - (i)
  - (ii)
  - (iii)
  - (iv)
  - (v)
- (h) Practical aspects involved in using a tool of evaluation in school situation are :
  - (i)
  - (ii)
  - (iii)
  - (iv)
  - (v)
  - (vi)

3. List the assumptions made when one computes a coefficient of stability.
4. Suppose a teacher wants to select students for a new branch of study which they have not studied earlier. For this the teacher wants to make sure that the selected students would succeed well in their future performance. Which type of validity is required to be there in such a test ?
5. Suppose you have prepared a test of creativity. In order to find out the validity of your test, you compare the scores obtained on this test with those obtained on another test of creativity which was standardized earlier. Specify the type of validity you are trying to find out.
6. Describe the procedure followed for establishing split-half reliability of a test.
7. How heterogeneity of group can affect coefficient of reliability ?
8. List the steps involved in determining construct validity of a test.
9. How teaching procedures affect the functional proficiency of a test ?
10. How can the nature of the group and the criterion influence the coefficient of validity ? Explain.

**4(B) 3.11 : The Correct Answer**

1. a —iii, b —ii, c —iii, d —iv, e —i, f —iv, g —ii, h —ii
2. (a) (i) Test-retest reliability  
(ii) Split-half reliability  
(iii) Equivalent form reliability  
(iv) Kuder-Richardson reliability  
(The order may differ)
- (b) (i) Reliability; (ii) Validity; (iii) Usability  
(The order may differ)
- (c) (i) Correlation between true and obtained scores.  
(ii) Comparative reliability  
(iii) Error in individual scores  
(The order may differ)
- (d) (i) length of the test  
(ii) Difficulty of test  
(iii) Heterogeneity of group  
(iv) Methods of estimating  
(v) Speededness  
(The order may differ)



- (e) (i) Content validity
- (ii) Predictive validity
- (iii) Concurrent validity
- (iv) Construct validity
- (The order may differ)
- (f) Construct validity
- (g) (i) Factors related to test-itself
- (ii) Teaching procedures and functioning content
- (iii) Factors in test administration and scoring
- (iv) Factors in student's responses
- (v) Nature of the group and the criterion.
- (The order may differ)
- (h) (i) Ease of administration
- (ii) Time required for administration
- (iii) Ease of scoring
- (iv) Ease of interpretation and application
- (v) Availability of comparable forms
- (vi) Cost
- (The order may differ)
- 3. Compare your assumption with those given in caption 4.3.2a.
- 4. Predictive validity
- 5. Concurrent validity
- 6. Compare your procedure with that given under caption 4.3.2c
- 7. Compare the theme of your answer with that given under caption 4.3.5c.
- 8. Compare your steps with those given under caption 4.3.7d.
- 9. Compare the theme of your answer with that given under caption 4.3.8b.
- 10. Compare the theme of your answer with that given under caption 4.3.8e.

#### 4(B) 3.12 : Suggestions for Further Reading

1. Adams, G.S., "Measurement and Evaluation in Education, Psychology, and Guidance", New York : Holt, Rinehart and Winston, 1964.
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3. Brown, F.G., "Principles of Educational and Psychological Testing", New York : Holt, Rinehart and Winston, 1976.
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6. Mehrens, W.A. and Ebel, R.L. (Eds.), "Principles of Educational and Psychological Measurement—A book of selected Readings", Chicago : Rand McNally and Co., 1967.
7. Payne, D.A. and McMorris, R.F. (Eds.), "Educational and Psychological Measurement—contribution to theory and Practice, New Delhi : Oxford and IBH Publishing Co., 1967.
8. Yadav, M.S. and Govinda, R., "Educational Evaluation—A Package of auto-instructional materials", Ahmedabad : Sahitya Mudranalaya, 1977.





## MODULE 4(B) 4

### CONSTRUCTION OF TEACHER-MADE ACHIEVEMENT TESTS

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#### 4(B) 4.0 : Specific Objectives of the Module

In Module 4(B) 2, namely, tools and techniques for evaluating outcomes of learning we have discussed various tools of measurement which can be used by the teachers in the schools. It was also pointed out, in that Module, that achievement tests are the most commonly used tools of measurement at the school. Looking to the importance of teacher-made achievement tests, it is essential to understand the process of its construction. Therefore, after reading this Module, the reader will be able :

- (1) to write down the various steps involved in the construction of achievement tests ;
- (2) to state the uses, advantages and limitations of essay tests ;
- (3) to state the points to be kept in mind while constructing easy questions and making the scoring reliable ;
- (4) to list different forms of objective test items ;
- (5) to explain the uses, advantages, and limitations of different forms of objective test items ; and
- (6) to state the points to be kept in mind while constructing different forms of objective test items.

**4(B) 4.1 : Steps in Construction of an Achievement Test**

The various steps followed for constructing an achievement test are as follows :

1. The first step is to define the objectives of instruction. Usually the majority of statements of objectives written by teachers are too vague and global to be useful as a guide to evaluation or teaching. To serve this purpose, the stated objectives should have the following characteristics :

- The objectives should be stated in terms of student behaviour, not in terms of learning activities or purposes of the teacher.
- The objectives should begin with an active verb that indicates the behaviour that a student should show in dealing with the content. Some of the active verbs are : write, list, distinguish, define, name, compare, label, state, explain, complete, select, record, determine, judge, restate, justify, compute, etc.
- The objectives should be stated in terms of observable changes in student behaviour.
- They should be stated precisely using terms that have uniform meaning.
- The objectives should be unitary ; each statement should relate to only one process.
- The objectives should be stated at an appropriate level of generality.
- Objectives should represent intended direct outcomes of a planned series of learning experiences.
- The objectives should be realistic in terms of the time available for teaching and the characteristics of the students.

2. The second step is to specify the content to be covered. The content is important because it is the vehicle through which the process objectives are to be achieved. The content and a statement of process objectives represent the two dimensions into which a test plan should be fitted. These two dimensions need to be put together to see which objectives specifically relate to which segments of content and to provide a complete framework for the development of the test. In planning for the total evaluation of a unit the teacher would be well advised to make a blueprint covering all objectives and a column to the blueprint indicating the items to be used in evaluating student-progress towards achieving each objective. However, in making a blueprint for a test, only those objectives that can be assessed either wholly or in part by a paper-and-pencil test should be included.





3. The third step is to write the test items according to the blueprint. In fact it has been suggested that the preliminary test writing should be concurrent with the teaching of the course. Many teachers find it helpful to jot down the ideas of the possible test items as they proceed with the teaching. This procedure makes sure that no important points are left out, nor any supplementary material of unusual value which is not found in the textbook is overlooked. This also provides the teacher an opportunity to have a second look and polish his own test items. Further in the preliminary draft of the test it is usually desirable to include at least 30-50 percent more test items than are likely to be required in the final form. This will permit the removal of the items that appear to be weaker or ineffective in the reviewing process.

4. The last step is to critically evaluate the test. This can be done by other teachers of the same subject, who may be able to discover the pitfalls. The following points should be kept in view while checking the items :

- Whether the item language and directions are clear or unambiguous.
- Whether there is adequate coverage of all the topics and objectives.
- Whether there are any items that test only trivial points.
- Whether the content of the statement elicit the right answers.
- Whether the items are so worded that its whole content rather than only a part of it functions in determining the answer.
- Whether the similar kinds of items are placed together.
- Whether the items of any particular kind are arranged in ascending order of estimated difficulty, beginning with very easy items and ending with very difficult ones.
- Whether the directions written for students are clear, complete and concise as possible.

#### **4(B) 4.2 : Points to be kept in Mind in Constructing a Test**

The following are some of the points to be kept in mind while constructing a test.

1. All outcomes of instruction cannot be measured with one type of test. Thus, appropriate test has to be constructed to measure outcome of instruction.
2. The insignificant and trivial items should not be included in the test but the test should be comprehensive.
3. The written items should be such so that they require the student actually to apply things learned rather than merely recall or recognise facts.



4. One must make certain that the type of item used for measuring each objective is the one that will measure best that objective.
5. The trick or catch questions should not be included in the test.
6. Do not "lift" statements directly from books and use them as test items.
7. One should try to avoid items with only two choices from which the student selects one.
8. One must be sure that no item can be answered simply by referring to other items. Thus, make each item independent of the others.
9. No item should be included for which the response is obvious to a person who does not know the subject matter.
10. The language of the item should be simple, clear and understandable.
11. The item should convey the same meaning to all those who read it.
12. Arrange the items so that responses will not form a particular pattern.
13. Arrange items in such a manner that it will not be necessary for the student to refer to more than one page in answering a given item.
14. The directions given to students for writing the responses, etc. should be written clearly and completely.
15. Arrange blanks for responses along one side of the page, if possible.
16. One should avoid the practice of underlining crucial words.
17. The test should not contain any ambiguous item.

#### **4 (B) 4.3 : Essay Type Tests**

According to "Dictionary of Education" by Good, essay test is a type of examination in which the subject or examinee is asked to discuss, enumerate, compare, state, evaluate, analyse, summarise, or criticise ; and involves writing at specified length on a given topic involving the processes listed above. Thus, essay type of questions provide a basis for evaluating the ability to organise, integrate, synthesise and evaluate knowledge. Responses to essay questions may also reflect student's attitudes, creativity, etc.—factors that may or may not be relevant to the purposes of the testing. Essay type tests, are the most widely constructed and used tests. Its advantages and limitations are given hereunder.

#### **4 (B) 4.3a : Advantages of Essay Type Tests**

1. It is easy to prepare and administer.
2. It can be used to measure complex learning outcomes which cannot be measured by other means.
3. Some of the objectives, like, an ability to organise idea effectively,

ability to criticise or justify a statement, ability to interpret, etc. can be best measured by this type of test.

4. It largely eliminated guessing.
5. The responses of students need not be completely right or completely wrong. All degrees of comprehensiveness and accuracy are possible.

#### **4(B) 4.3b : Limitations of the Essay Type Tests**

1. The poor content sampling is one of the serious drawback of essay type tests. This inadequate sampling makes essay questions especially inefficient for measuring knowledge of factual information.
2. The unreliability of scoring is another disadvantage of essay type test.
3. The scoring is time consuming.
4. Some irrelevant variables, like handwriting and neatness, get assessed and lower the validity of the scores.

#### **4(B) 4.3c : Writing the Essay Questions**

The following points are to be kept in mind while writing the essay questions.

1. Essay questions may be used to measure those learning outcomes which cannot be measured by objective items. Some of the learning outcomes, such as those pertaining to the organization, integration, expression of ideas, etc. will be neglected unless essay questions are used. It is by restricting its use to these areas that the essay question's unique contribution to the evaluation of student achievement can be most fully realized.
2. Start essay questions with such words or phrases as compare, contrast, give the reason for, give original examples of, predict what would happen if, criticise, differentiate, illustrate etc. The uses of such words or phrases will help to present tasks requiring the students to select, organise, and use his knowledge.
3. Write questions in simple words so that it conveys the same meaning to all students.
4. Do not ask too many or too lengthy questions to answer in the time available. The number of questions that can be included in essay test depends upon the complexity and length of the desired answer, the grade and ability of the student, and time available for testing. An essay test would not be a test of speed of writing.
5. All students should be required to answer the same questions. Giving a choice of questions reduces the common basis upon which different



students may be compared. This increases the subjectivity and inaccuracy that already exist in essay tests.

6. The directions should be written very clearly. A good set of directions for an essay test should include statements covering (a) the form in which the answer should be written, that is, connected prose or outline form ; (b) the general criteria that will be used in evaluating the answers ; and (c) the time available for taking the test.

#### 4(B) 4.3d : Scoring Essay Tests

The scoring of essay tests can be made reliable if the following points are kept in mind while scoring the essay tests.

1. Decide in advance what qualities are to be considered in judging the adequacy of the answer. If more than one distinct quality is to be appraised, make separate evaluations of each. This will enable the teacher to make a judgement of the extent to which the student is achieving the distinctive objectives of the content subject and to reveal to the student whether any deficiency in answering the question is due to weakness in subject matter or weakness in written expression or both.
2. Prepare a model answer in advance. This should contain the major points to be included, the characteristics of the answer to be evaluated, and the amount of credit to be allotted to each. After preparing the model answer, it should be checked against a sample of student answers. No ratings should be given to this sample of papers because the purpose of this is to determine the adequacy of the model answer. If the check reveals that students have consistently interpreted the question differently from the way the teacher had intended or they have answered the question at a consistently lower level than the expected answer, then the model answer should be revised so as to correspond more closely to the performance.
3. Evaluate all answers to one question before going to the next question. This will help to maintain a more uniform set of standards of grading across papers. Further more, the teacher is less likely to be influenced in his judgement of the quality of the answer to another question by how the student has answered the previous one.
4. Evaluate the answers without looking at the student's name and/or roll number.
5. After scoring the answer to one question for all papers, shuffle or rearrange the papers before starting to score the next question, because the teacher's rating of a particular paper can be influenced by the quality of the answer in the paper that he has just finished reading.

6. There are a number of factors that influence the evaluation of answers to essay questions which are not directly pertinent to the purposes of the measurement. Some of such factors are legibility of handwriting, spelling, sentence structure, punctuation and neatness. Therefore, decision has to be taken for handling such factors which are not relevant to the learning outcomes being measured. In other words, one has to decide in advance approximately how much the score on each question is to be lowered where the inclusion of irrelevant material is excessive.

#### **4(B) 4.4 : Objective Type Tests**

The second type of test is the objective type. It refers to any written test that requires the student (examinee) to select the correct answer from among one or more of several alternatives or supply a word or two, and is scored objectively. Its advantages and limitations are given below.

##### **4(B) 4.4a : Advantages of the Objective Type Test**

1. It can be scored objectively. The scoring will not vary from examiner to examiner or time to time.
2. It contains items which cover almost the entire content.
3. There is economy of time both in administration and scoring.
4. It eliminates assessment of irrelevant factors such as speed of writing, spelling, neatness, good handwriting, etc.

##### **4(B) 4.4b : Limitations of Objective Type Tests**

1. Guessing is possible.
2. Printing cost is considerably greater than that of an essay type test.
3. The construction of objective type test items is difficult. It is time consuming and requires expertise.
4. Objectives like ability to organise matter, ability to present matter logically and in a coherent fashion, etc. cannot be evaluated.

#### **4(B) 4.5 : Classification of Objective Type Items**

The objective item includes a variety of different types, but they can be classified into those which require the student to supply the answer and those which require him to select the answer from a given number of alternatives. These two general classes are commonly further divided into the following basic types of objective test items :

##### **I. Supply types :**

- (1) Short-answer
- (2) Completion

##### **II. Selection types :**

- (1) True-false or alternative response



- (2) Matching
- (3) Multiple choice

#### 4(B) 4.6 : Short-answer and Completion Type Items

The short-answer item and the completion item are both supply-type test items as mentioned above. Both of these can be answered by a word, phrase, number, symbol, chemical formula, etc. They are essentially the same, differing only in the method of presenting the problem. In the case of the short-answer item a direct question is used, whereas the completion item consists of an incomplete statement. The examples are as follows.

Short-answer : 1. What is the formula for Sulphuric acid ?  
2. What is the Capital of India ?

Completion : 1. The formula for Sulphuric acid is———.   
2. The——— is the Capital of India.

The short-answer type and completion type items can be used to measure knowledge of terminology, specific facts, principles and method; simple interpretation of data such as ability to interpret diagrams, charts, graphs, and various types of pictorial data, ability to solve numerical problems, ability to complete and balance chemical equations, etc. In deciding whether to use short-answer items or some other item type, the general principle to follow is: Each learning outcome should be measured as directly as possible and the test item type which is most appropriate for that purpose should be selected for use.

#### 4(B) 4.6a : Advantages of the Short-answer or Completion Type Items

- 1. It provides little opportunity for guessing as the student is required to supply information or to solve a numerical problem.
- 2. It requires more than mere recognition.
- 3. It can be scored more objectively than the essay type test items.
- 4. A relatively larger sample of the content can be covered.
- 5. It can be scored more quickly than the essay.

#### 4(B) 4.6b : Limitations of the Short-answer or Completion Type Items

- 1. It may penalise the better students unduly and unduly help the weaker ones. The former have insufficient scope to show their abilities, while the latter have less chances to expose their weaknesses.
- 2. Certain answers may not be possible in short-answer form—for example, answers to questions on literary appreciation.
- 3. It is difficult to write good short-answer items which may require a student to exhibit abilities like that of synthesis and interpretation.

4. Its excessive use may encourage students to memorise and develop poor study-habits because they are best for measuring highly specific facts like dates, names, vocabulary, places etc.

**4(B) 4.6c : Points to Remember in Constructing Short-answer and Completion Type Items**

The following points should be kept in view while constructing short-answer type tests.

1. Structure the item in such a way so that the required answer is both brief and definite.
2. Do not take statements directly from textbooks to use as basis for short-answer items.
3. Decide precisely what knowledge, ideas, or skills are to be tested.
4. Make sure that only one word or short phrase is the correct response.
5. Do not leave many blanks in a given statement least the statement loses its meaning.
6. Make all spaces in the same statements of the same length, so that the size of space can be no clue to the length of the right word or phrase. Any space should be large enough for the longest word or phrase.
7. Within a single statement, omitted words or phrases should be of parallel grammatical significance to prevent the operation of syntactical clues.

**4(B) 4.7 : True-false or Alternative-response Type Items**

The true-false item consists of a declarative statement that the student is asked to mark true or false, right or wrong, yes or no, correct or incorrect, fact or opinion, agree or disagree etc. In each case there are only two choices. The student decides which of the two answers is correct and marks it. The examples are as follows :

*Directions :* Listed below are a number of statements. Read each one of them carefully. If the statement is true, encircle "T". If the statement is false, encircle "F".

- T F 1. The ohm is the unit of current.
- T F 2. An electric current can be measured by using an ammeter connected in series with the circuit.
- T F 3. The earth is a planet.
- T F 4. The earth revolves around the moon.

The alternative-response type items can be used to measure the ability to identify the correct acts, definitions of terms, statements of principles, distinguish fact from opinion, recognize cause-and-effect relationship, etc.



**4(B) 4.7a : Advantages of Alternative-response Type Items**

1. It is relatively easy to construct. For this reason it is extensively used.
2. It can be used to sample a wide range of subject matter.
3. It can be scored readily in an objective manner.
4. They are adaptable to most content areas.
5. If such type items are carefully constructed, they can measure the higher mental processes of understanding, application and interpretation.
6. It is especially useful when there are only two choices governing a particular point.
7. It can be used to measure the ability to identify the correctness of statements, distinguish facts from opinion, recognise the cause-effect relationships, etc.

**4(B) 4.7b : Limitations of Alternative-response Type Items**

1. It encourages guessing. With only two alternatives, a student has a 50-50 probability of selecting the correct answer on the basis of chance alone.
2. It is difficult to construct items that are either completely true or completely false without making the correct response obvious.
3. The diagnostic value of such a test is practically nil, since analysing a student's response to each item is meaningless.
4. The validity of student's responses is questionable because of response sets. A response set is a consistent tendency to follow a certain pattern in responding to test items.
5. It is difficult to avoid ambiguities, unimportant details, and irrelevant clues. A common weakness is that the items are taken directly from a textbook.
6. An alternative-response test is likely to have a low reliability unless it includes a large number of items.
7. An alternative-response test is difficult to construct if the material is in any way controversial.

**4(B) 4.7c : Points to Remember in Constructing Alternative-response Type Items**

The following points are to be kept in mind while constructing alternative-response type items.

1. Use simple and clear language to avoid ambiguity. Avoid loose quantitative terms, like, more much, lighter, heavier, few, etc.
2. Don't take statements verbatim from the textbook.
3. Make approximately an equal number of true and false items.
4. A random occurrence of true and false items should be employed to avoid giving irrelevant clues.
5. The correction for guessing should be used in scoring the test. The standard correction formula for guessing is :

$$\text{Score} = R - \frac{W}{n-1}$$

Where R = number of right responses.

W = number of wrong responses.

n = number of alternatives for an item.

6. Avoid catch questions and broad general statements.
7. Avoid the use of negative statements, and especially double negatives. Also avoid trivial, long and complex sentences.
8. Don't include two ideas in one item, unless cause-effect relationships are being measured.
9. The true statements and false statements should be approximately equal in length.

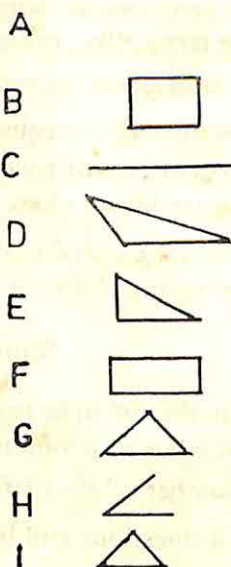
#### 4(B) 4.8 : Matching Type Items

The matching type item requires the matching of two or more sets of material in accordance with given directions. The common matching item consists of two parallel columns with each word, number, or symbol in one column being matched to a word, sentence, or phrase in the other column. The student is required to match each item in one column with the item in the other column to which it is most closely related. An example is given below.

*Directions :* The columns below contain illustrations of geometric figures and their names. You are to match the names in the left-hand column with the proper illustration in the right-hand columns. Write the identifying letter in the blank space provided.



- 1. Square
- 2. acute angle
- 3. right angled triangle
- 4. isosceles triangle
- 5. obtuse angle



Whenever learning outcomes emphasise the ability to identify the relationship between two things, and a sufficient number of homogeneous premises and responses can be obtained, matching type items seem to be most appropriate to use.

#### 4(B) 4.8a : Advantages of Matching Type Items

1. It is relatively easy to construct.
2. It can be made totally objective and can be scored quickly.
3. When it is properly constructed, the guessing factor is practically eliminated.
4. Many questions can be asked in a limited period of testing time because they required relatively little reading time.
5. A large number of responses can be included in a small space and with one set of directions.

#### 4(B) 4.8b : Limitations of Matching Type Items

1. It is restricted to the measurement of factual information based on rote memorization, and it is highly susceptible to the presence of irrelevant clues.
2. It is difficult to find homogeneous material which is significant from the point of view of learning outcomes. Therefore, less significant material is introduced into the test because significant material of a homogeneous nature is not available.

3. Since the phrases or clauses must necessarily be short, the matching type item provides a poor measure of complete understandings and interpretations.

#### 4(B) 4.8c : Points to Remember in Constructing Matching Type Items

The following points are to be kept in mind while writing matching type items.

1. Include at least three extra choices from which responses are to be chosen.
2. Use only homogeneous or related materials in a single match item.
3. Keep the list of items to be matched brief and place the shorter responses on the right of the page.
4. Use illustrations whenever possible.
5. Arrange the items in selection column in a logical order. This is to make it easier for the student to locate the correct responses.
6. At the time of writing the item, keep the student in the mind.
7. Write directions very clearly and specifically.
8. Make sure that the entire item appears on one page.

#### 4(B) 4.9 : Multiple-Choice Type Items

A multiple-choice type item consists of a question or incomplete statement followed by several possible answer. The student is asked to select the best or correct answer in accordance with the directions given therein. The multiple-choice item can usually be stated either as a question or as an incomplete statement as shown in the following example :

Direct-question form :

A pentagon has how many sides ?

- a. 3
- b. 4
- c. 5
- d. 6
- e. 7

Incomplete statement form :

The number of sides contained in a pentagon is.....

- a. 3
- b. 4
- c. 5
- d. 6
- e. 7

The multiple-choice type item is most widely applicable and useful type of objective test item. There are various variations in the construc-



tion of multiple-choice items. First, the simplest kind of multiple-choice item is the one right answer type. In this type, the student is required to identify the one correct response listed among totally wrong but not obviously wrong ones. Second, the best answer type of multiple-choice item. In this the student is required to select the best response from several responses. This type of multiple-choice item may be varied to require the student to : (1) select two best responses from a set of possible answers, (2) indicate the worst response or the least desirable response, (3) indicate both the best and the worst responses. The best-answer type of multiple-choice item tends to be more difficult than the correct-answer type. This is due to the finer discriminations called for and also, due to the fact that such items are used to measure learning outcomes of a more complex nature. The best-answer type is useful to measure the student's ability to use logical reasoning and make application of things learned.

The multiple-choice type items are useful to measure knowledge of terminology, specific facts, principles, methods and procedures ; ability to apply facts and principles ; ability to interpret cause and effect relationships ; and ability to justify methods and procedures.

#### **4(B) 4.9a : Advantages of Multiple-choice Type Items**

1. Multiple-choice tests can be completed in reasonably short time.
2. The scoring is objective, since a key of correct answers is available.
3. The guessing factor does not present as much of a problem in multiple-choice items as in several other types. It can be reduced by increasing the number of alternatives to four or five.
4. The ambiguity and vagueness which are frequently present in the short-answer item are avoided in this type because the alternatives provide greater structure to the situation.
5. The multiple-choice items can be designed to measure effectively the student's ability to interpret, discriminate, select and make application of things learned. It can be used to measure understanding, judgement, and inferential reasoning ability.
6. Multiple-choice item is relatively free from response sets.
7. The use of a number of possible alternatives makes the results amenable to diagnosis.
8. It is easier to construct high quality test items in this form than in any of the other objective forms.

#### **4(B) 4.9b : Limitations of a Multiple-choice Type Item**

1. It is difficult to construct. It is difficult to think of plausible distractors.

2. It takes a short time to score a multiple-choice test but a long time to construct it.
3. The multiple-choice test is space and time consuming.
4. The multiple-choice test does not demand coherence of expression, which in some areas may be of paramount importance. The student is required only to perform a simple act of recognition or recall, he is not required to formulate ideas. Thus, it is not well-adapted for measuring the ability to organise and present ideas.

#### 4(B) 4.9c : Points to Remember in Constructing Multiple-choice Type Items

The following points should be kept in mind while constructing multiple-choice type items.

1. The stem or the first part of the item should be meaningful by itself and should present a definite problem.
2. The item should be practical and realistic.
3. The stated problem should be specific, clear and as brief as possible.
4. Illustrations are sometimes useful in presenting the central problem.
5. All the alternatives should be grammatically consistent with the stem of the item.
6. An item should contain only one correct or clearly best answer.
7. Have at least four and preferably five possible choices.
8. All distracters should be plausible.
9. Avoid the inclusion of clues.
10. Include no responses that are obviously wrong.
11. Place the choices at the end of the question or incomplete statement.
12. List each choice on a separate line.
13. The correct answer should appear in each of the alternative positions approximately equal number of times and in random order.
14. Use special alternatives such as "none of the above" or "all of the above" sparingly.
15. Don't use multiple-choice items where other item types are more appropriate.

#### 4(B) 4.10 : Test Yourself

1. In the following incomplete sentences each incomplete sentence is followed by a few alternative phrases. Of these, one alternative is most suitable to make the incomplete sentence complete and meaningful. Encircle the serial number of the most suitable alternative which you choose.
  - (a) The essay type test is to be used in the examination because.....  
.....



- (i) it can measure knowledge effectively.
  - (ii) it is easy to administer.
  - (iii) it can measure objectives of higher level effectively.
  - (iv) it can measure objectives of lower level effectively.
- (b) The scoring of essay type test can be made more reliable by.....
- (i) conducting the test strictly.
  - (ii) getting it scored from more than one examiner.
  - (iii) formulating alternative questions.
  - (iv) preparing model answer in advance.
- (c) If there are incomplete statements in one of the columns in a matching type test then the student has to.....
- (i) select a suitable answer from the other column.
  - (ii) complete the statement at his own.
  - (iii) leave them as it is.
  - (iv) consider them as wrong questions.
- (d) Properly constructed objective type tests are .....
- (i) as objective as essay type tests.
  - (ii) highly objective.
  - (iii) subjective.
  - (iv) none of the above.
- (e) There is less scope for guessing in completion type test because students.....
- (i) cannot guess.
  - (ii) cannot write long answers.
  - (iii) have to write specific answers.
  - (iv) have to write their own answers.
2. Write down different steps followed in constructing an achievement test.
  3. List down various characteristics that stated objectives should possess.
  4. List down various points to be kept in view while checking the items.
  5. List down 12 points to be kept in view while constructing a test.
  6. Write down advantages and limitations of essay type questions.
  7. List down any five points to be kept in mind while writing essay questions.
  8. Write down various precautions to be kept in view while scoring essay tests so that the scoring becomes objective.
  9. Write down the advantages and limitations of objective type tests.
  10. State advantages and limitations of short answer type tests.

11. List any six points to be kept in mind while writing short-answer type tests.
12. State advantages and limitations of alternative-response type items.
13. Write down any eight points to be kept in mind while constructing alternative type items.
14. List down advantages and limitations of matching type items.
15. List any eight points to be kept in mind while constructing matching type items.
16. Write down advantages and limitations of multiple-choice type items.
17. List any twelve points to be kept in mind while constructing multiple-choice items.

**4(B) 4.11 : Correct Answer**

1. a—iii, b—iv, c—i, d—ii, e—iv.
2. Compare the steps with those given under caption 4.4.1.
3. Compare the characteristics with those given under caption 4.4.1.
4. Compare the points with those given under caption 4.4.1.
5. Compare the points with those given under caption 4.4.2.
6. Compare the advantages and limitations with those given under captions 4.4.3a and 4.4.3b respectively.
7. Compare the points with those given under caption 4.4.3c.
8. Compare the precautions with those given under caption 4.4.3d.
9. Compare the advantages and limitations with those given under captions 4.4.4a and 4.4.4b respectively.
10. Compare the advantages and limitations with those given under captions 4.4.6a and 4.4.6b respectively.
11. Compare the points with those given under caption 4.4.6c.
12. Compare the advantages and limitations with those given under captions 4.4.7a and 4.4.7b respectively.
13. Compare the points with those given under caption 4.4.7c.
14. Compare the advantages and limitations with those given under captions 4.4.8a and 4.4.8b respectively.
15. Compare the points with those given under caption 4.4.8c.
16. Compare the advantages and limitations with those given under captions 4.4.9a and 4.4.9b respectively.
17. Compare the points with those given under caption 4.4.9c.



**4(B) 4.12 : Suggestion for Further Reading**

1. Adams, G.S., "Measurement and Evaluation in Education, Psychology and Guidance", New York : Holt, Rinehart and Winston, 1964.
2. Gronlund, N.E., "Measurement and Evaluation in Teaching", New York : Macmillan Publishing Co., Inc., 1976.
3. Rawat, D.S., "Measurement, Evaluation and Statistics in Education", New Delhi : New Raj Book Dept., 1970.
4. Stanley, J.C. and Hopkins, K.D., "Educational and Psychological Measurement and Evaluation", New Delhi : Prentice-Hall of India Private Limited, 1978.
5. Yadav, M.S. and Govinda, R., "Educational Evaluation—A package of auto instructional material", Ahmedabad : Sahitya Mudranalaya, 1977.

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## MODULE 4(B)5

### DIAGNOSTIC TEST AND REMEDIATION

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#### 4(B) 5.0 : Specific Objectives of the Module

All of us know that some students learn fast while others learn slowly. This shows that some students have some difficulties in learning. The nature and type of learning difficulty may vary from student to student. But once the learning difficulties for a particular student are identified, these can be overcome through remedial measures and the slow learner may rise to the level of the fast learner. Diagnosis of learning difficulties is a scientific process and so is remediation. Therefore, one must acquaint oneself with it. Hence after reading this Module the reader will be able :

- (i) to define diagnosis,
- (ii) to write principles of diagnosis,
- (iii) to state steps followed in diagnosis,
- (iv) to define diagnostic test,
- (v) to write steps followed in the construction of diagnostic test,
- (vi) to state principles of remediation,
- (vii) to write how to begin remediation, and
- (viii) to write role of testing and evaluation in remediation.



#### 4(B) 5.1 : Principles of Diagnosis

Before stating the principles of diagnosis, let us know what is diagnosis? Good<sup>1</sup>, in *dictionary of education*, defines diagnosis as : (1) the procedure by which the nature of a disorder, whether physical, mental or social, is determined by discriminating study of the history of the disorder and of the symptoms present; (2) the process of determining the existing capabilities of a student by analysing his performance of a hierarchy of essential tasks in a specific subject, such as mathematics or music, with the intent of facilitating his learning by assigning appropriate remedial or advanced learning tasks. The following are some principles of diagnosis which are to be followed so as to have reliable diagnostic findings.

- The first principle is to establish rapport. This is important so that the student is at ease, does not have any tension and he is encouraged into a cooperative attitude. This ultimately helps the student to perform at his best.
- The second principle is to provide for individual and group study. Normally, a group testing procedures tend to produce unreliable results for the student with a reading problem. So individual study becomes essential. That is, the individual be studied apart from, as well as within, the group to assure as accurate as possible analysis of his reactions to learning.
- The third principle is to test and not to teach. During testing procedures, special effort must be made to resist the temptation to prompt the child to give the proper answer through teacher like comments, such as "That's almost right, try again, etc." Such comments can make the student justifiably encouraged or discouraged. In either case, this action invalidates the diagnostic findings.
- The fourth principle is to assure thoroughness. The diagnosis seldom terminates with the initial diagnostic period but it continues during remedial sessions. In majority of cases, the informal diagnosis and shorter periods of formal diagnosis will be interspersed during remedial sessions where precise diagnostic findings are formulated and put to use.
- The fifth principle is to maintain efficiency. That is, an efficient diagnosis is one which includes those measures needed by the educator to properly arrive at a solution to the problem ; it eliminates those which have questionable value in relation to the final objective of the diagnosis.

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1. Carter V. Good (Ed.), "Dictionary of Education", New York : McGraw Hill Book Company, Inc. 1959, pp. 170



- The last principle is to evaluate diagnostic data in terms of patterns. It requires a diagnosis to include several interrelated measures of the student's reading abilities. When similar errors occur on all the interrelated measures, a pattern of error is established; when they occur only on one or two measures, a different pattern appears. If reversals occur in one situation but not in another, the diagnostic conclusions should indicate the situation in which reversals occur.

#### 4(B) 5.2 : Steps in Diagnosis

The essential steps in diagnosis are (1) identifying the students who are having learning difficulties, (2) determining the specific nature of the learning difficulty, and (3) determining the factors causing the learning difficulties. Each one of them are described below :

##### 4(B) 5.2a : Identifying those having Difficulty

There are different methods for identifying those students who are having learning difficulties. One method is to compare the results of standardized achievement tests with the results of a scholastic aptitude test. If the student's level of achievement is lower than his level of scholastic aptitude, it is assumed that he is not achieving upto his potentiality or capacity and, therefore, there is a need to diagnose the learning difficulties faced by the student. While using this procedure for identifying those students who are having learning difficulties, the following points are to be kept in mind.

- In order to compare achievement scores with scholastic aptitude scores, both these scores must be expressed in comparable units.
- Both the achievement and scholastic aptitude tests must be standardised on the same population.
- The discrepancies between the achievement and aptitude across must be relatively large to offset the possibility of the differences arising from measurement errors.
- It is not possible to detect all under-achievers by this method because some learning difficulties will tend to lower the scores on both tests and make it appear that aptitude and achievement are in agreement.

Another method is to analyse a standardised achievement test item by item and make a tally of those missed by each student. Items which are missed by majority of students indicate areas where the class as a whole is doing poorly. This might suggest that either the test has inadequate content validity, or that changes in curriculum and teaching method are needed. The errors of each student can also be studied for clues to his particular learning difficulties. One important point in using an analysis



of item responses to determine individual learning difficulties pertains to the small number of items representing each area. Such an analysis provides clues which must be followed by further observation and testing.

Apart from the above mentioned methods, informal classroom evaluation procedures can also be used to determine learning difficulties. The classroom tests can be analysed item-by-item in order to detect group and individual learning errors. Anecdotal records, rating scales, checklists, etc. can also provide clues concerning learning problems. The day-by-day observations and judgements of a teacher can be used to identify learning difficulties.

In determining learning difficulties of students, one should not confine his efforts to those with problems in the basic skills and the content areas but one should also try to find out difficulties in emotional adjustment, social relations, and other aspects of personal-social development. Problems related to these areas are important because they have a direct bearing on the student's ability to learn in different subjects.

#### **4(B) 5.2b : Determining the Specific Nature of the Learning Difficulty**

Once it is located which students are having learning difficulties, the next step is to determine precisely the nature of the learning difficulty. One method is to administer a diagnostic test. The diagnostic tests are based on the common errors students make and thus provide a systematic method for locating the specific problem. Such tests tend to provide a more reliable sample of a student's errors than the achievement tests because diagnostic tests have a large number of items representing each particular aspects of the skill being measured.

Another method is to administer an achievement test and ask the student to describe aloud the mental process he is following as he is answering each question. This thinking aloud provides clues to the student's weaknesses in knowledge, and skill and method of attacking problems. Since the test is administered on an individual basis, it is also possible to note any emotional factors or undesirable habits which might be interfering with the student's responses. The cumulative record may also help in determining the specific nature of a student's learning difficulties. Apart from these, a scrutiny of past test results, course grade, anecdotal records, and other evaluative data can frequently throw light on the nature of a student's present difficulty.

#### **4(B) 5.2c : Determining the Factors causing the Learning Difficulty**

After determining the nature of specific learning difficulties, one should try to find the factors causing the learning difficulty. Some learning



difficulties can be attributed to improper teaching methods, unsuitable curricular emphasis, or exceptionally complex course material. It is easy to detect these factors because a large number of students will experience the same difficulty. When this occurs, one should try to remove the short comings related to instructional method and material.

There are certain learning difficulties which cannot be accounted for by faulty instruction. To determine the causes of such problems, one should make a careful study of the student and his environment. The major areas to consider are the student's scholastic aptitude; reading, arithmetic and language skills; study habit; health and physical condition; emotional adjustment; home and school environment; etc. Unfavourable factors in any of these areas might cause or contribute to learning difficulties.

But it is important to note that the causes of learning difficulties are multiple and complex, and it is difficult to determine them fully. However, a review of the student's cumulative record, special testing and observations (as needed), an interview with the student, and possibly a home visit, should provide sufficient information on which to base the remedial work.

#### **4(B) 5.3 : Steps in Construction of a Diagnostic Test**

Before knowing various steps followed in construction of a diagnostic test, it is proper to know what is a diagnostic test? Good<sup>2</sup>, in *dictionary of education*, defined "diagnostic test as (1) an examination intended to measure achievement in a narrow subject field or related subfield, particularly with a view to determining specific weaknesses of pupils as a basis for remedial measures; (2) an examination the results of which permit a broad, general diagnosis of pupil's weaknesses and strengths".

In the preparation of a diagnostic test steps followed will be more or less the same as in the case of achievement test. The various steps are planning; writing the items; assembling of the items; providing directions; preparing the scoring-key and marking scheme; and reviewing and editing. Each one of them is explained below.

#### **4(B) 5.3a : Planning**

The designing of a diagnostic test is significantly different from that of an achievement test. In order to make correct diagnosis, a teacher needs much more data on the specific difficulties of students. Diagnostic tests have, therefore, to be much longer than the achievement test, to make necessary subtests sufficiently reliable. Further, it requires more

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2. Ibid : p. 558.



detailed and exhaustive content analysis. During content analysis, the content (unit) is to be broken into learning points and these are to be arranged in a hierarchical order. There should be no omission of learning points. In other words there should be continuity in learning points. If some learning points are omitted, the diagnostic test will become faulty as the weaknesses of those students who are deficient in them will go untouched. There is no need to prepare a blue print during the preparation of diagnostic tests.

#### **4(B) 5.3b : Writing the Items**

As far as the diagnostic test is concerned, it is not very important to know the relative importance of the various learning points because we are not to decide their relative weightages. The basic principle is to cover all of them so as to give an unbroken sequence. So, for each learning point an adequate number of items or questions have to be written so as to provide decisive evidences. Preferably more than three items should be written for each learning point. The items should be of objective type which includes the short-answer type. The items should be of average difficulty level. No rigid time should be fixed. In other words students should be allowed to take as much time as they like for answering all the items. Various points to be kept in mind while writing different types of items have already been discussed under caption 4(b)4.

#### **4(B) 5.3c : Assembling of the Items**

After the items on different learning points are selected, they have to be assembled into a test. The basis of arranging items or questions in diagnostic test is entirely different from that of other tests. In the diagnostic tests, the questions should be clubbed around the learning points, even when the questions are of different types. The learning points and the corresponding questions are to be arranged in hierarchical order of their complexity. If they are so arranged, students need not change their mental sets. Further, this arrangement also helps in analysing the responses of students with a view to identify their weaknesses.

#### **4(B) 5.3d : Providing Directions**

Clear and specific instructions for students should be written. If this is not done, the wrong response may be attributed to the faulty instruction. So, it will be difficult to identify the weaknesses. Further, instructions for its administrations should also be written very clearly. The person using the test must follow the instructions.



**4(B) 5.3e : Preparing Scoring Key and Marking Scheme**

In order to increase the reliability, validity and objectivity of the test results, the scoring key and marking scheme should be provided.

**4(B) 5.3f : Reviewing and Editing**

The test should be given to subject specialist and the items should be modified in the light of their suggestions.

**4(B) 5.4 : Principles of Remediation**

In order to make remedial programme effective, the following principles should be followed.

- The first principle is that the student must have a successful and satisfying experience during the remedial programme. Thus, the remedial programme should be such that the student who has experienced frequent failure in reading begins the remedial programme with the attitude that this educational experience will be both different and rewarding. Without this attitude, even the best remedial programme will fail. So, it is better that all the early lessons be directed towards the student's strong points. As the remedial programme progresses, the percentage of time devoted to strong points of students is likely to decrease. Still throughout the entire remedial programme, a large portion of every lesson be directed to the strengths or strong points of students.
- The second principle is that the remedial successes must be told to the student. During the remedial programme the student experiences a success but the success must be real and must be presented to the student so that he is actually aware that he has been successful.
- The third principle is that the remedial programme must provide for transfer to actual reading situations. During remedial programme there will be occasions when isolated drill in various areas will be required; however, drill activities should always come from contextual reading material and should always conclude in contextual reading situations.
- The fourth principle is that the remedial programme should be flexible. That is, during the remedial programme, the activities should be adjusted according to the changing needs of the child.
- The fifth principle is that the remedial programme should be conducted in terms of established goals. That is, right in the beginning the instructional objectives should be stated in behavioural terms. During the development of goals, the students should be involved.



- The last principle is that the remedial programme should result in skill development. The remedial programme should be designed to develop the reading skills in which the student has demonstrated a deficiency, and not merely to help him to get through the class work. The student should not become solely dependent upon remedial programme for his daily school success.

#### **4(B) 5.5 : How to begin Remediation**

Different individuals may begin the remedial programme in their own way and, also, as the situation demands. But the following procedure may be followed for its execution.

- We know that the remediation is based on diagnostic findings, but initial efforts in remediation must concentrate on the student's interest and his sense of worthiness. That is, the remedial programme should start with highly interesting activities which aim at his diagnosed strong points.
- No direct attack on the student's weakness be made. The teacher should move his instruction slowly to the diagnosed weakness. While no rules exist, the following suggestions are offered for making the switch over from strengths to weaknesses tolerable for the student.
- Begin and end every lesson with activities that guarantee success.
- In an hour session, spend not more than ten minutes on areas of weakness, using strengths to get at weaknesses.
- Involve the student in planning his activities. He will start saking for activities which will get at his diagnosed needs.
- Give instructions in small groups and search for ways for such student to succeed in the group every day.
- Provide opportunities for extra reinforcement through constant contact with parents and other teachers so that they can also reinforce the student by pointing out his success.
- Provide options for the student so that he either can choose or ignore certain activities.
- Provide rewards for successful work in new areas.
- Provide situations in which the student can work with other students as a working partner.

#### **4(B) 5.6 : Role of Testing and Evaluation in Remediation**

The testing and evaluation can play a vital role in remedial programmes.

The use of periodic testing during remedial teaching might serve the following functions :

- It may clarify to the pupil the specific types of responses that are expected.
- It may provide further diagnostic information about the student's difficulties and learning needs.
- It may give the student a feeling of success through the use of a carefully graded series of test exercises.
- It may enhance motivation by providing short-term goals and immediate knowledge of progress.
- It may provide information concerning the effectiveness of the remedial procedures.

#### 4(B) 5.7 : Test Yourself

1. Write down the definition of 'diagnosis' in 4-6 lines.
2. Explain various principles of diagnosis.
3. Write down the definition of diagnostic test in 4-6 lines.
4. Explain various steps used in diagnosis.
5. Explain various steps followed in the construction of a diagnostic test.
6. Describe principles of remediation.
7. Describe how you will start remediation.
8. List down the role of testing and evaluation in remediation.

#### 4(B) 5.8 : Correct Answer

1. Compare the theme of your answer with that given under caption 4.5.1
2. Compare the principles written by you with those given under caption 4.5.1
3. Compare theme of your answer with that given under caption 4.5.3
4. Compare the steps written by you with those given under caption 4.5.2
5. Compare the steps written by you with those given under caption 4.5.3
6. Compare the principles written by you with those given under caption 4.5.4
7. Compare your answer with that given under caption 4.5.5



8. Compare your answer with that given under caption 4.5.6

**4(B) 5.9 : Suggestions for Further Reading**

1. Adams, G.S., "Measurement and Evaluation in Education, Psychology, and Guidance", New York : Holt, Rinehart and Winston, 1964.
2. Gronlund, N.E., "Measurement and Evaluation in Teaching", New York : Macmillan Publishing Co., Inc., 1976.
3. Wilson, R.M., "Diagnostic and Remedial Reading for classroom and clinic columbus, Ohio : Charles E. Merrill Publishing Company, 1972.

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#### MODULE 4(B) 6

### INTERPRETATION AND USE OF TEST RESULTS

#### 4(B) 6.0 : Specific Objectives of the Module

We have become acquainted with different tools of measurement. Each one of them is to be used for a specific purpose. In order to evaluate a particular learning outcome, a test is administered and scored according to scoring procedure laid down in the manual of the test. Now question arises what does this score mean ? In other words, what is the interpretation of this score ? Without interpretation, the implications of the result will not be known. Therefore, it is essential to know about the interpretation of the score. Hence, after reading this module, the reader will be able to :

- (1) Write the criterion-referenced interpretation of scores,
- (2) give the norm-referenced interpretation of scores,
- (3) list different types of test norm,
- (4) define grade norms, age norms, and percentile norms,
- (5) interpret grade norms, age norms and percentile norms,
- (5) state the importance and advantages of local norms,
- (7) list those qualities which are most desired in norms, and
- (8) list the points to be kept in mind while interpreting test scores,



#### 4(B) 6.1 : Criterion-referenced Interpretation

One way to interpret a raw score, obtained by administering and scoring a test, is by converting it into a description of the specific tasks that the student can perform. We have seen that a teacher prepares a test after specifying the learning outcomes to be measured through it. That is, the test items are in harmony with the instructional objectives or learning outcomes. In other words, the test items are selected on the basis of their relevance to the objectives being measured, and there is a sufficient number of test items to make dependable judgements concerning the types of task a student can and cannot perform. With these assumptions about a test, the teacher can say from the scores the extent to which the instructional objectives have been achieved by particular students. The percentage of correct score is widely used in criterion-referenced interpretation. Suppose a student gets 80 percent of marks on a test which fulfils the above mentioned requirement, then it may be said that this student could achieved 80 percent of the set objectives.

The standardized tests primarily have been designed for norm-referenced interpretation but it is possible to attach criterion-referenced meaning to the test results or scores. This can be done by analysing responses of each student item by item and summarizing the results with descriptive statements. For example, Shyam has solved all multiplication problems involving no carrying but he could solve only four of the ten problems requiring carrying. The criterion-referenced interpretation of standardized scores can be made more effective provided the following are fulfilled : (i) the list of objectives measured by the standardized test ; (ii) the list specifying the objective measured by the items, i.e., which item measures which objective ; and (iii) arranging the items into homogeneous groupings for easy analysis.

Although it is possible to make criterion-referenced interpretation of standardized test scores but it is advisable not to do so. However, if it is to be done, the following points are to be kept in mind.

- Standardized achievement tests contain few items representing each specific objective. Therefore, it is difficult to get reliable descriptions about the attainment of objectives.
- Majority of standardized tests use selection-type items. Therefore, the guessing will increase. That is, it will be difficult to say whether an item is responded correctly due to guessing or otherwise. This distortion is serious where a few items are used to measure each particular objective.
- Lastly, the difficulty level of items is kept at 50 percent level so that maximum discrimination among students is obtained. This means

easy items are omitted from the test. This will effect the low achievers because most of the items which they are able to attempt have been eliminated from the test.

#### 4(B) 6.2 : Norm-referenced Interpretation

The norm-referenced interpretation tells us how an individual compares to other persons who have taken the same test. In other words, an individual's performance is compared to the scores of other individuals in a relevant reference group which is known as norm group. The norm group is composed of people who share certain characteristics with the individual. For example, on a classroom examination the norm group will be other persons taking the same course ; on intelligence test, children of the same age, etc. There are a number of possible norm groups for any test. But here the discussion has been restricted to grade norms, age percentile norms and local norms.

#### 4(B) 6.3 : Grade Norms

The grade norms are used with standardized achievement tests. They are based on the average scores earned by students in each of a series of grades and they are interpreted in terms of grade equivalents. Suppose, students in the standardization group who are beginning the sixth grade earn an average raw score of 30, this score is assigned a grade equivalent of 6.0 : The tables of grade norms are made up of such pairs of raw scores and their corresponding grade equivalent. The grade equivalents are expressed in two numbers ; the first indicates the year and the second the month. The grade equivalents for the sixth grade range from 6.0 to 6.9, for seventh grade it ranges from 7.0 to 7.9, and so on. This division of the calendar year into tenths assumes little or no change in test performance during the summer vacation. To convert to grade equivalents with a table of grade norms, all one needs to do is to locate in the table the student's raw scores and read off the corresponding grade equivalents. Suppose Ram is in the middle of sixth grade and his grade equivalents in Hindi, English and Mathematics are 6.5, 8.0 and 5.5 respectively. In examining these grade equivalents one can say that Ram is exactly average in Hindi, one and a half year advanced in English but one year beyond in Mathematics. This will be the interpretation.

The grade equivalents scores are based on units which are typically unequal. This can lead to misinterpretations and tend to limit the usefulness of the test results. In general grade norms are most useful for reporting growth in the basic skills during the elementary school period. They are least useful for comparing a student's performances on different



tests. Thus, for whatever purpose grade norms are used, inequality of grade units must be considered during interpretation of the results.

#### 4(B) 6.3a : Age Norms

Age norms are based on the average scores earned by students at different age levels and are interpreted in terms of age equivalents. For example, if students who are 8 years and three months of age earn an average raw score of 31, this score is assigned an age equivalent of 8-3. The tables of age norms in a test manual present parallel columns of raw scores and their corresponding age equivalents. The age equivalents for 8 year old range from 8-0 to 8-11.

The use of age norms is most common with reading tests and mental ability tests but they can be used in any achievement area. They are most suitable in those areas where growth patterns tend to be fairly consistent.

Age norms present test performance in units that are apparently easy to understand but the age units are characteristically unequal. This is due to variations in patterns of growth at different age levels. The age norms are likely to be most meaningful at the elementary school level where growth in abilities tends to be continuous and somewhat regular. But at the high school they are likely to be misinterpreted because the growth in many abilities tends to level off. Literal interpretation of age norms should be avoided.

#### 4(B) 6.3b : Percentile Norms

A percentile rank or percentile score indicates a student's relative position in a group in terms of the percentage of students scoring below him. Suppose a student gets 27 marks. From the table of percentile norms it was found that the raw score of 27 is equal to percentile rank of 70. This means that 70 percent of students in the reference group obtained a raw score lower than 27 and 30 percent of them obtained a raw score higher than 27.

The major advantage of percentiles is that it is easy to interpret. Knowing a student's relative ranking in a relevant comparison group is, to most persons, a simple, readily comprehensible, and meaningful index of performance. Further for many purposes, ranking within a group is sufficient. We know that a percentile rank describes a student's performance in terms of the percentage of students he surpasses in some clearly defined group. This might be his own grade or age group or any other group of which he desires to become a member. Thus, more than one set of norms is usually required and percentile rank must be interpreted in terms of the specific norm group on which they are based.



Percentile ranks have two limitations. First, percentile ranks cannot be added, subtracted, multiplied, or divided. This is not a serious limitation while interpreting scores, but it is serious when they are used for further statistical analysis. Second, the percentile ranks have a rectangular distribution but test scores distributions generally approximate the normal curve. As a consequence, small raw score differences near the center of distribution result in large percentile differences. Conversely, large raw score differences at the extremes of the distribution produce only small percentile differences. Due to these differences, the percentile ranks can be misinterpreted. In particular, large differences in percentile ranks near the center of the distribution tend to be overinterpreted.

#### 4(B) 6.3c : Local Norms

Many times it so happen that the students on which the test is used for some purpose deviate markedly from those on whom the norms are based. This deviation may be due to differences in respect of certain characteristics like, educational experience, cultural background, medium of instruction, socio-economic status, etc. Thus, it is advisable to prepare local norms. They are more desirable whenever they are to be used for instructional purposes. The main advantage of local norms is that they allow for comparisons between a person and his immediate associates. Although local norms provide information relevant to immediate local decisions, yet they do not allow for interpretations in a broader context. For this the norms based on a larger sample as usually given in a manual will be more suitable.

#### 4(B) 6.3d : Judging the Adequacy of Norms

We have learnt that an individual's score can be compared with the group score by making use of table of norms provided in the manual of the test. The adequacy of test norms is an important factor to be considered during interpretation of test scores. Apart from this there are certain other qualities which are most desired in norms. These are as follows :

1. The test norms should be relevant to the group for which they are to be used.
2. The test norms should be representative.
3. The test norms should be up-to-date.
4. The test norms should be adequately described. The test manual must include information related to method of sampling ; number and distribution of cases included in the norm sample ; characteristics of norms group, such as, age, sex, socio-economic status, geographical location, educational level, type of school, medium of instruction,



etc., the extent to which standard conditions of administration were maintained during the testing ; and date of the testing.

5. Lastly, the test norms should be comparable.

#### 4(B) 6.4 : Precautions in Interpreting Test Scores

The following precautions are to be kept in mind while interpreting test scores.

1. We know that no two achievement tests, aptitude tests, intelligence tests, etc., measures exactly the same thing. Therefore, a test score should be interpreted in terms of the specific test from which it was derived.
2. We know that a test score may be influenced by student's aptitudes, emotional adjustment, cultural background, socio-economic status, educational experiences, mental health, language handicap, etc. Thus, a test score should be interpreted in light of all relevant characteristics of the student.
3. The test result can be used in different ways. The meaningfulness of a test score is determined to a considerable extent by its use. So, a test score should be interpreted in terms of the type of decision to be made.
4. The test scores can be influenced if it is not administered the way it should have been. Also, if the basic assumptions of testing have not been met, the test score would be affected. This lowers the reliability of scores and consequently the reliability of interpretation will be lowered. In such situation, a test score should be verified by supplementary evidence before it is to be interpreted.
5. Every test score is subjected to error and this error should be taken into consideration at the time of interpretation of test score. The best way to interpret is to consider a student's test performance as a band of scores, one standard error of measurement above and below his obtained score. For example, if a student get a score of 70 and the standard error is 8, his performance should be interpreted as a band ranging from score 62 ( $70-8=62$ ) to score 78 ( $70+8=78$ ). Thus, a test score should be interpreted as a band of scores rather than a specific value.

#### 4(B) 6.5 : Use of Test Results

The evaluation process or the test results can contribute to improve teaching-learning process in a conventional classroom in a number of ways :

- It can help to clarify the instructional objectives for both the teacher and the student. This helps the teacher in the planning of instruction

and, also, in guiding learning activities. It provides students with a better knowledge of the learning outcomes to be achieved.

- It can help in preassessing the student's abilities and needs. Such information is useful in determining learning readiness, in properly placing students in a learning sequence, and in adapting instruction to group and individual needs.
- It can assist in monitoring learning progress during instruction. Periodic testing and evaluation during instruction (formative evaluation) can be used to identify learning deficiencies, to plan corrective actions, to motivate student for learning, and to increase retention and transfer of learning.
- It can help in diagnosing and remedying learning difficulties. Test results are useful in identifying which students are having learning difficulties, in determining the specific nature of the difficulty, in detecting causes of the difficulty, and in applying appropriate remedial procedures.
- Lastly, it helps in evaluating the effectiveness of instruction. Such evaluation results provide information that can be used in reviewing the methods and material of instruction, and in comparing alternative programmes of instruction.

#### 4(B) 6.6 : Test Yourself

1. Complete the following statements with suitable word or words.
  - (a) The test results can be interpreted in terms of \_\_\_\_\_ and \_\_\_\_\_.
  - (b) The adequacy of test norms can be judged by determining the extent to which they are :
    - (i)
    - (ii)
    - (iii)
    - (iv)
    - (v)
  - (c) The age norms describe test performance in terms of the \_\_\_\_\_ in which a student's raw score is just \_\_\_\_\_.
  - (d) Then the test score is interpreted to describe an individual's test performance without reference to the performance of the group, this is known as \_\_\_\_\_ interpretation.
  - (e) When the test score is interpreted to describe an individual's relative position, this is known as \_\_\_\_\_ interpretation.
  - (f) Grade norms are least useful for \_\_\_\_\_.
  - (g) Grade norms are most useful for \_\_\_\_\_.



- (h) Local norms are used when the students on which the test is used———.
2. List the points to be kept in mind while making criterion-referenced interpretation of standardized test scores.
  3. Write the definition of norm group in 3-4 lines.
  4. Write the definition of grade norms in 3-5 lines.
  5. List down the advantages of percentile norms.
  6. List down the limitation of percentile norms.
  7. Write down the advantages of local norms.
  8. List down the cautions to be kept in mind at the time of interpretation scores.
  9. State various uses of test results.

#### 4(B) 6.7 : The Correct Answer

1. a—norm-referenced, criterion-referenced  
 b—i—relevant, ii—representative, iii—up-to-date, iv—comparable,  
 v—adequately described (The order may differ)  
 c—age group, average.  
 d—criterion-referenced.  
 e—norm-referenced.  
 f—comparing a student's performance on different tests.  
 g—reporting growth in the basic skills during elementary school period.  
 h—deviate markedly from those on whom the norms are based.
2. Compare your list with those given under caption 4.6.1
3. The norm group is composed of people who share certain characteristics with the individual. (Your answer should resemble theme).
4. The grade norms describe test performance in terms of the particular grade group in which a student's raw score is just average. (Your answer should resemble in theme).
5. Compare the advantages written by you with those given under caption 4.6.5.
6. Compare the limitations with those given under caption 4.6.5.
7. Compare the advantages with those given under caption 4.6.6.
8. Compare the list of caption with that given under caption 4.6.8.
9. Compare the uses with those given under captior 4.6.9.

**4(B) 6.8 : Suggestions for Further Reading**

1. Anastasi, A., "Psychological Testing", London : The Macmillan Company, 1968.
2. Cronbach, L.J., "Essentials of Psychological Testing", New York : Harper and Row, 1970.
3. Gronlund, N.E., "Measurement and Evaluation in Teaching", New York : Macmillan Publishing Co., Inc., 1976.
4. Lyman, H.B., "Test Scores and What They Mean", Englewood cliffs N.J. : Prentice-Hall, Inc., 1971.

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